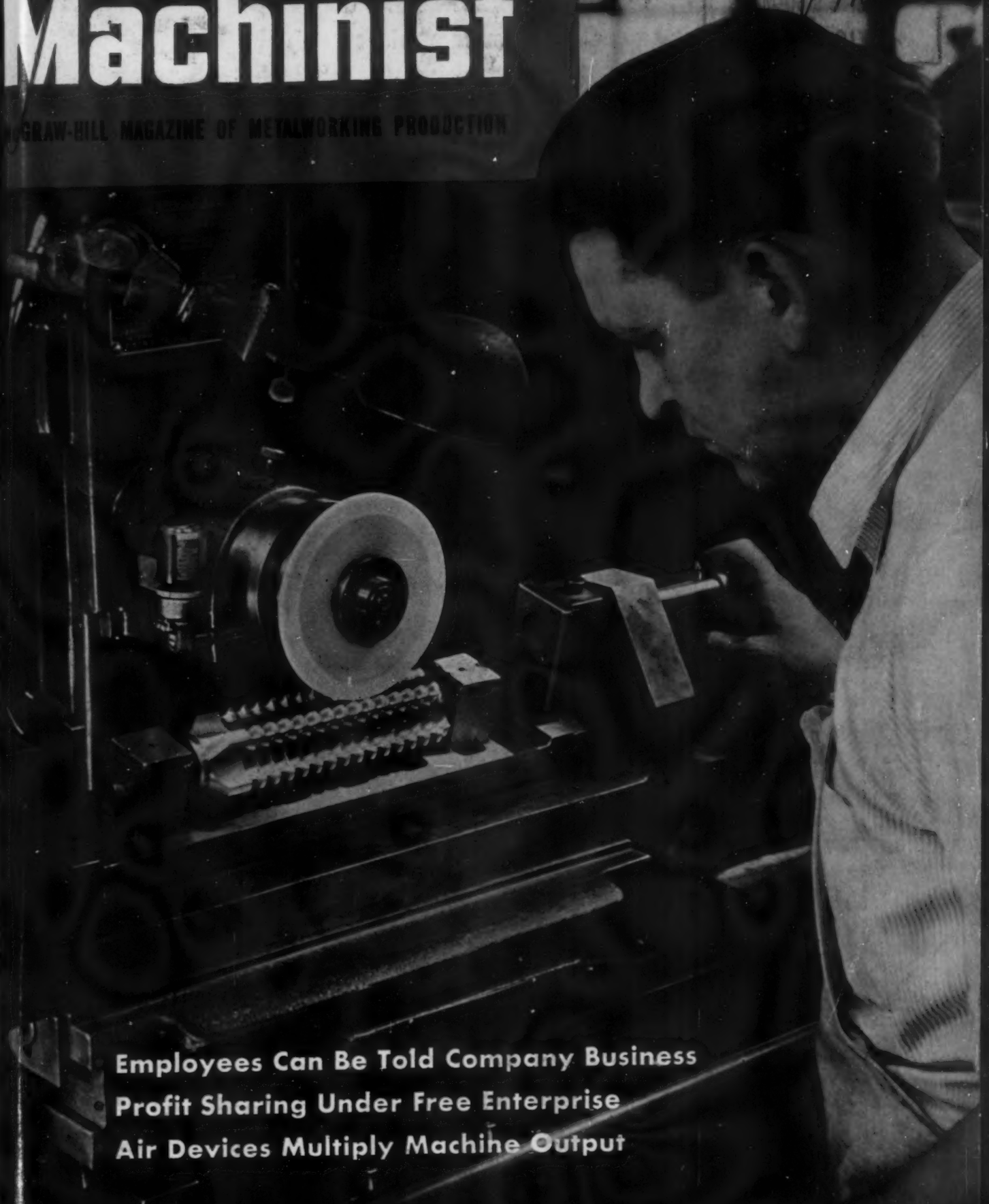
American Machinist

MARCH 25, 19

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION



Employees Can Be Told Company Business

Profit Sharing Under Free Enterprise

Air Devices Multiply Machine Output

Extra CAPACITY and PERFORMANCE

On the Heald Model 261 Rotary, a completely new vertical column-type surface grinder

HERE'S an *entirely new* approach to precision surface grinding. In its new Model 261 Rotary, Heald has mounted the wheelhead on a rigid vertical column . . . runs the work in and out on a reciprocating table . . . and swivels a rotating, magnetic chuck up to 17° for angular grinding. Result: *more* capacity for *more* operations on *more* parts.

This is Heald's answer to industry demands for greater precision, smoother finish, maximum production. And it's only part of the answer—one of 19 *all-new* Heald Precision Grinders (surface and internal) and Bore-Matics. Get in touch with the Heald branch office nearest you for complete details.

HEALD

THE HEALD MACHINE COMPANY

Worcester 6, Mass.

Branch Offices in Chicago • Cleveland • Dayton • Detroit
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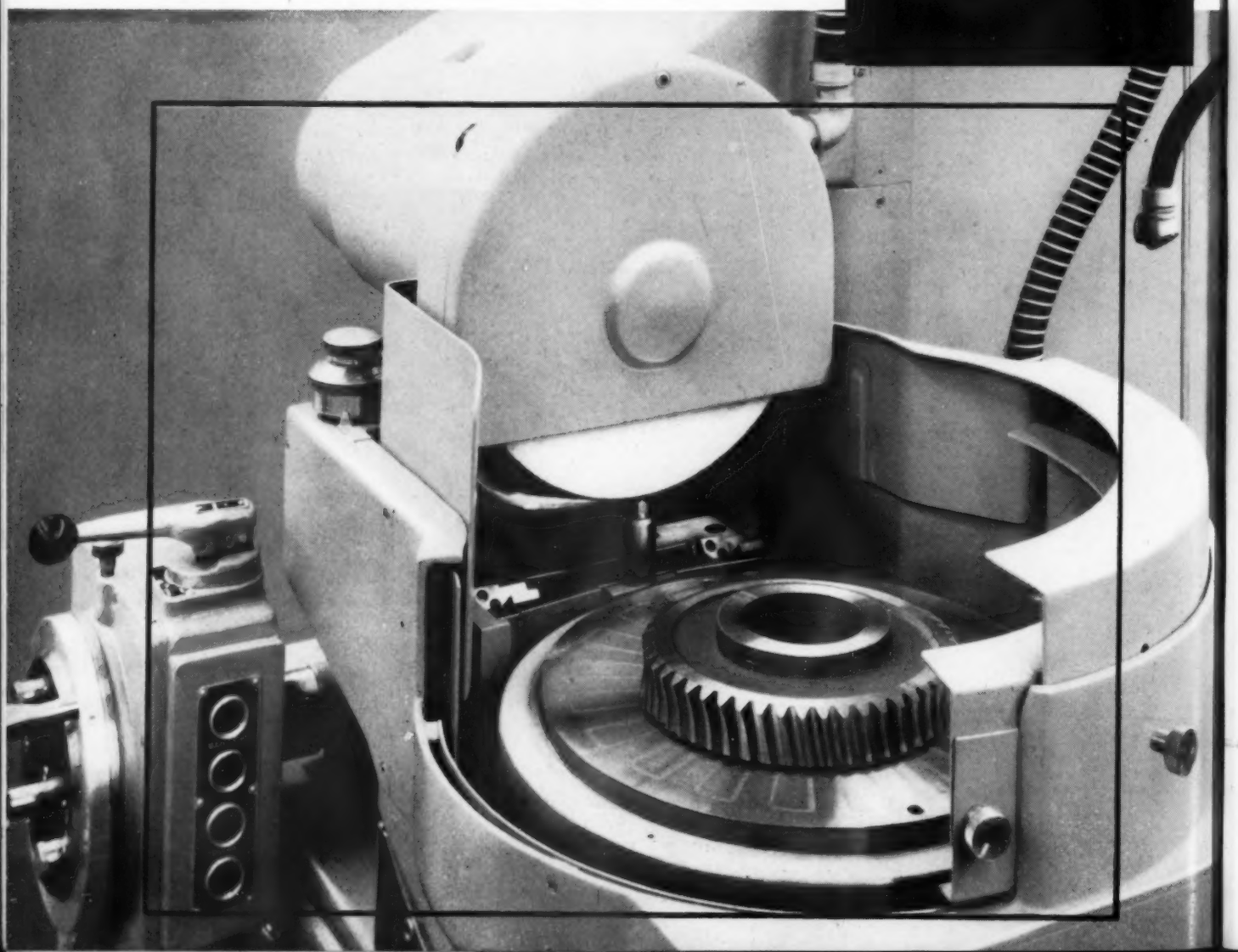

American Machinist

MAGAZINE OF METALWORKING PRODUCTION

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MAR 25 1948
DETROIT

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James H. McGraw, Jr., President; James H. McGraw (1860-1948), Founder; Curtis W. McGraw, Senior Vice-President and Treasurer; Nelson Bond, Director of Advertising; Eugene Duffield, Editorial Assistant to the President; Joseph A. Gerardi, Secretary; J. E. Blackburn, Director of Circulation.

Chips and QUIPS

Our Cover . . . Backing off the radii of a 5-point finishing broach shell, used in shaving the inner contour of a pump rotor, shows in this U. S. Broach Kodachrome. The machine is, of course, a Brown & Sharpe No. 2B surface grinder, with a magnetic chuck, and a special radius-grinding fixture on the table. The fixture serves as a cradle and is rocked to conform to broach contour.

Ear to Ground . . . Editor Burnham Finney and cohorts have been collecting data for some months for our current special report on how to tell employees the facts. A pertinent subject for today.

More Air . . . Compressed air took over many tricky jobs during the war, has been doing very well with them since. Here, in four pages of pictures, we show you some recent applications. . . . Also for tooling men we provide a group of machining shop shots from the plant of Lord Mfg. Co., Erie, Pa., and a special press that does a difficult assembly job by virtue of its triple action. . . . Keep your eye on Fred Victory, too; he's giving some new concepts in building dimensionally stable elements.

More People . . . Our *A.M.* Index for 1946 listed 388 authors; our 1947 one lists 697. Shows our wider-spreading efforts to get you the newest and best. . . . We even get some things without authors—like the fact that nurserymen get 5% of their business from factories wishing to beautify their grounds to lift worker morale. This, of course, says nothing about nurserymen's morale.

More on the Zulu Maid . . . You undoubtedly saw the Zulu maid in the South Bend Lathe ad in our Annual Review (Jan. 29 A.M., page 327). Fred Colvin, from 'way down in Florida, was moved to this metric reply to the ad's question: "Would You Hire this Zulu Girl to Run a Lathe?"

Who wouldn't hire the Zulu maid
To run a lathe or such?
Her costume's economical,
It wouldn't cost you much.
No fuss about the length of skirt,
No coverall to buy;
No sleeves to catch in belts or gears—
Just goggles for the eye.
As for your own, you'd have to wear
Sun glasses of deepest hue
Or you'd forget the kind of work
The gal was hired to do!

What's a Bureau? . . . Clever Martha Taft (Mrs. Sen. Robt.) said recently Washington has "a highboy Government —one bureau piled on top of another." E. B. Van Horn, Senate Expenditure Committee staff chief, after ten years of study, explained bureaus this way:

Bureaus aren't the top organizations. Above them are departments and agencies. Only sometimes they're called boards, administrations, authorities or controls.

Each department or agency usually has several bureaus. Only sometimes bureaus are called offices. But this is incorrect. Offices should designate only high officials' personal staffs.

Sub-functions of bureaus are handled by divisions. This doesn't mean anything either. In the Interior Department, a division is a branch, office or service.

If a division is divided up it comes out in branches and units. Units are little branches, usually with not more than half a dozen workers. A confusing trifle: The Treasury Department has one unit of 35,000 workers, but no branch or divisions over it—only the Bureau of Internal Revenue.

Coming . . . April 8 *A.M.* is one of those issues full of short, snappy data. The special report deals with cold heading—a subject upon which no printed information has been available. It's an *AM* first . . . Other subjects: spinning thick plate, how plant layout controls materials movement, multiple machining of a group of parts, a tricky progressive die, hard facing to improve tool life, curved chutes to aid work ejection. Dr. Haig Solakian begins a series of three articles on heat-treating salt baths.

ENTERPRISER . . . When Carl A. Norgren, president of C. A. Norgren Co., Denver, says "Free enterprise" (see his article herewith), he knows what he's talking about. Graduated from U.S.D. with degrees in mechanical and electrical engineering, he now manufactures hydraulic and pneumatic accessories and is on the NAM Board. Before starting his business in 1925, he worked in engineering and sales with Fairbanks Morse Co., Salt Lake Hardware Co. and Chicago Pneumatic Tool Co. Hobbies: farming in Colorado, ranching in South Dakota and raising pure-bred Hereford cattle. Activities: president, Game and Fish Commission, Colo.; chairman, Agricultural Committee, Denver Chamber of Commerce; member, Board of Trustees, Colo. Museum of Natural History; member, National and Regional Councils, Boy Scouts of America; chairman, United American Life Insurance Co.

BEVEL GEAR *Design? Manufacture? Application?*

WE OFFER YOU:

1. SOLUTIONS OF YOUR BEVEL GEAR DESIGN PROBLEMS,
2. ESTIMATES OF YOUR PRODUCTION TIME AND COSTS,
3. RECOMMENDATIONS ON THE RIGHT EQUIPMENT FOR YOUR NEEDS,

WITHOUT OBLIGATION.

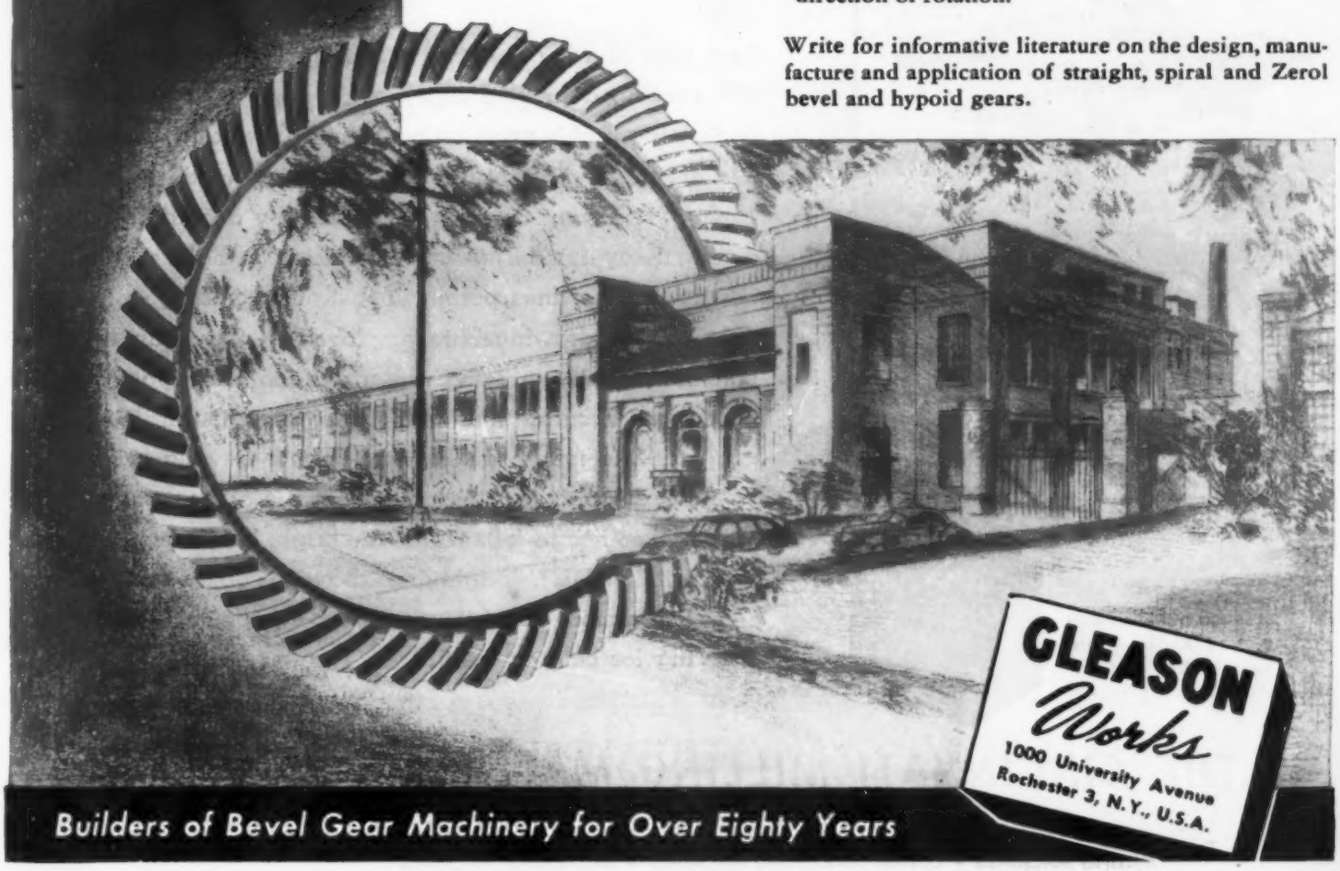
Highly skilled engineers backed by a wealth of experience in bevel gear design and manufacture will study your bevel gear drive designs, make suggestions, estimate production time and costs, and recommend the correct bevel gear manufacturing equipment.

Utilize the complete Gleason Engineering Service by sending us:

For production engineering: (1) Blueprints of your bevel gear designs, (2) Material specifications and manufacturing tolerances, (3) Quantity of gears to be produced per month, and (4) Number of working hours per month available for gear production.

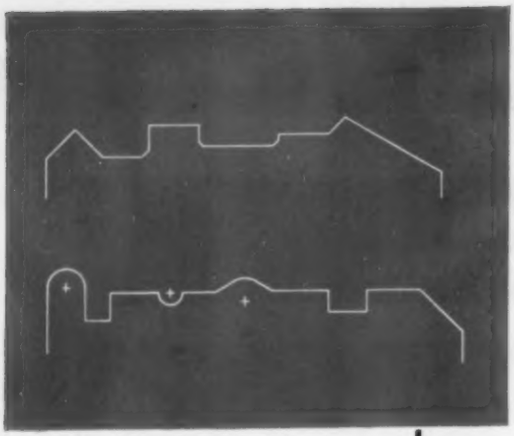
For design engineering: (1) Preliminary layouts or prints of proposed bevel gear drive designs, (2) Type of drive, (3) Horsepower and speed required, (4) Type of loading (constant, intermittent or shock), and (5) Driving member and direction of rotation.

Write for informative literature on the design, manufacture and application of straight, spiral and Zerol bevel and hypoid gears.



GLEASON *Works*
1000 University Avenue
Rochester 3, N.Y., U.S.A.

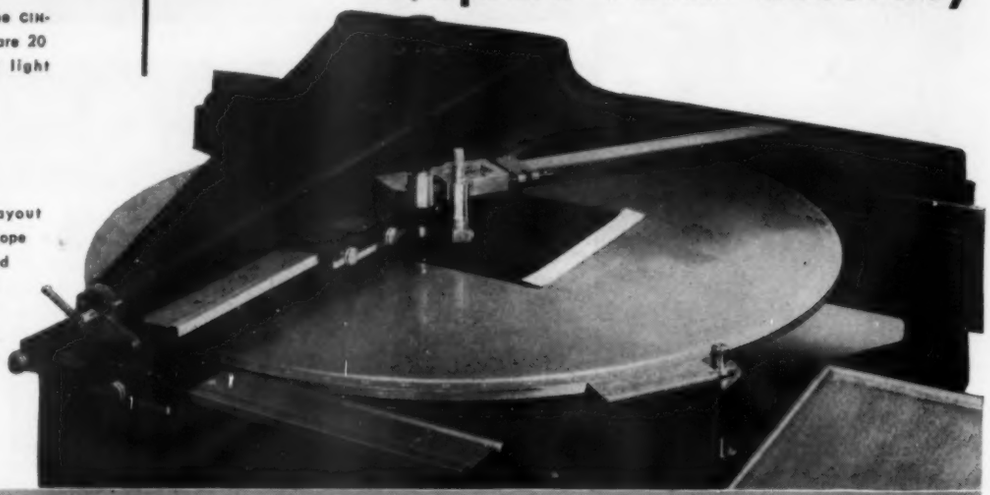
Builders of Bevel Gear Machinery for Over Eighty Years



Bright line drawings, made on the CINCINNATI Layout Scribing Machine, are 20 times size; permit passage of light through the lines.

"Bright Line" DRAWING

. . . guardian of Projecto-Form accuracy



Close-up of CINCINNATI Layout Scribing Machine. The microscope is mounted on the scriber, and a glass plate has been taped to the swivel plate, preparatory to making a drawing.

CINCINNATI Layout Scribing Machine. The drawings made on this equipment, termed "bright line" drawings, are used in the setup on CINCINNATI Projecto-Form Grinding Machines. Ask for catalog M-1612.

CINCINNATI Projecto-Form Grinding Machine. Catalog M-1612.

Ever hear of a "bright line" drawing? It's a term which will become a familiar byword of accuracy in shops performing profile grinding operations on small form tools and die parts. "Bright line" drawings are made on CINCINNATI Layout Scribing Machines, by accurately cutting away tinted translucent emulsion on a glass plate. Obviously, the lines permit unobstructed passage of light. These drawings are employed in the setup on CINCINNATI Projecto-Form Grinders. ¶A carbide tipped stylus cuts an accurate line .004" wide. Since the drawing and the image on Projecto-Form's viewing screen are 20 times size, the ground surface of the work whose image falls within the bright line is accurate within .0002". "Bright line" drawings do the trick. Learn more about this new shop equipment by writing for catalog M-1612.

THE CINCINNATI MILLING MACHINE CO.

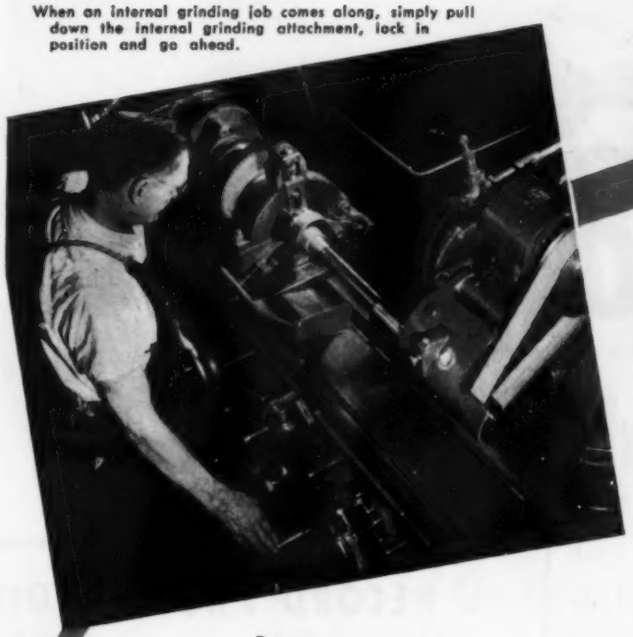
CINCINNATI

CINCINNATI 9, OHIO, U. S. A.

MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES

INTERNAL

When an internal grinding job comes along, simply pull down the internal grinding attachment, lock in position and go ahead.



EXTERNAL

Grinding the taper, 3½" per foot, on the shank end of an attachment drive gear. Notice that internal grinding attachment is up and out of the way. It does not interfere with straight or tapered external work.

CINCINNATI

FILMATIC

YOU CAN QUICKLY CHANGE FROM EXTERNAL • TO INTERNAL • TO TAPER SETUPS

EXTERNAL

CINCINNATI FILMATIC 14" Hydraulic Universal with a variety of work ready to be ground.

. . . on Cincinnati Filmatic Hydraulic Universal Grinders

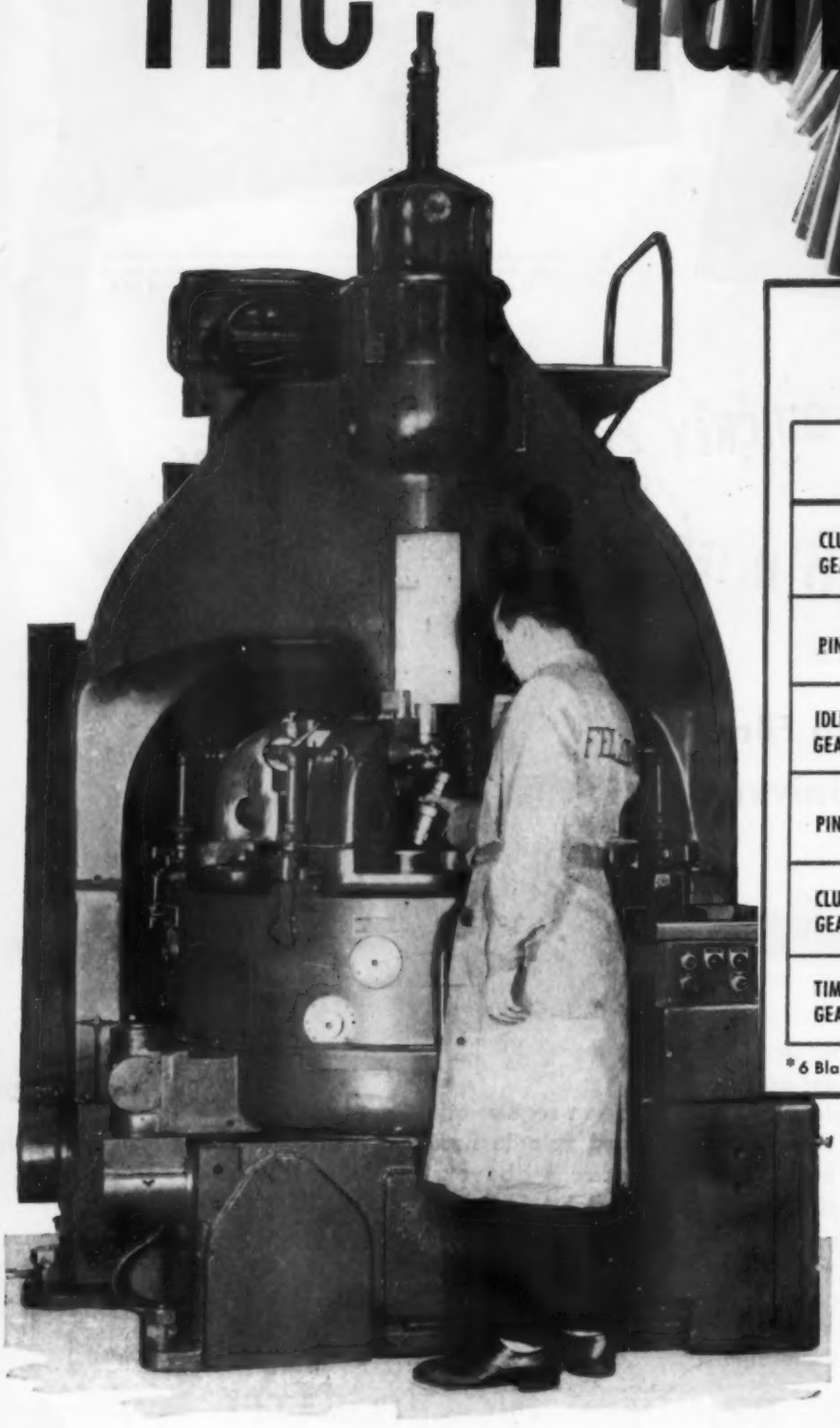
How long does it take to get going on small lots? Whatever the answer is, set-up time constitutes one of the major elements in the cost of small quantity precision toolroom grinding. Reduce set-up time, and costs go down fast. You can be sure of brief setups on CINCINNATI FILMATIC Hydraulic Universals, for they have many features of value in small quantity production. To mention only three: hinged type internal grinding attachment, always on the job; Filmatic spindle bearings, never require adjustment; lathe standard spindle nose on headstock. ¶The photographs above show three toolroom setups which take advantage of CINCINNATI Hydraulic Universals' many features. Others have just as much value in reducing costs. All of them, plus complete specifications, are contained in these catalogs: 12" machine, G-486-4; 14", 16" and 18" machines, G-474-3. Send for copies.

CINCINNATI GRINDERS INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

CENTER TYPE GRINDING MACHINES • CENTERLESS LAPPING MACHINES • CENTERLESS GRINDING MACHINES

The Planetary



RECORD PRODUCTION on a wide

	MATERIAL	FACE WIDTH	PITCH	PITCH DIAM.	
CLUSTER GEAR	FORGED STEEL	.687" .656"	7.5 7.5	3.200" 3.733"	
PINION	SAE 4620	1.187"	16	1.818"	
IDLER GEAR	SAE 5150	.750"	10/12	1.900"	
PINION	SAE 1045	.238"	16	1.562"	
CLUSTER GEAR	FORGED STEEL	.500" .400"	16 16	3.375" 2.875"	
TIMING GEAR	SAE 1045	.238"	16	3.125"	

* 6 Blanks on arbor ** 8 Blanks on arbor

PIECES

GEAR SHAPERS • THREAD GENERATORS • CUTTERS • SHAVING AND BURNISHING MACHINES

...TAILORED TO THE JOB for *SPEED* beyond anything known before

CAPACITY
variety of gears

NO. OF TEETH	TYPE	PIECES PER HOUR
24 28	SPUR SPUR	128 128
28	HEL.	120
19	SPUR	128
25	SPUR	250*
54 46	SPUR SPUR	143 179
50	SPUR	334**

PER HOUR

• On Continuous Production Runs

Investment cost and production-rate advantages may well make The Planetary the most profitable gear cutting machine you can buy. The table opposite tells its own story. Here you have a machine of massive power, for heavy feeds, and high speed cutting as the work planets around the giant reciprocating cutter.

• High Accuracy Always

You expect it of every machine bearing the Fellows name. The Planetary is no exception. The progressive cutting by successive groups of teeth around the big-diameter cutter, produces an exceptionally fine finish, as well as involute accuracy. Write, or call on the office nearest you.

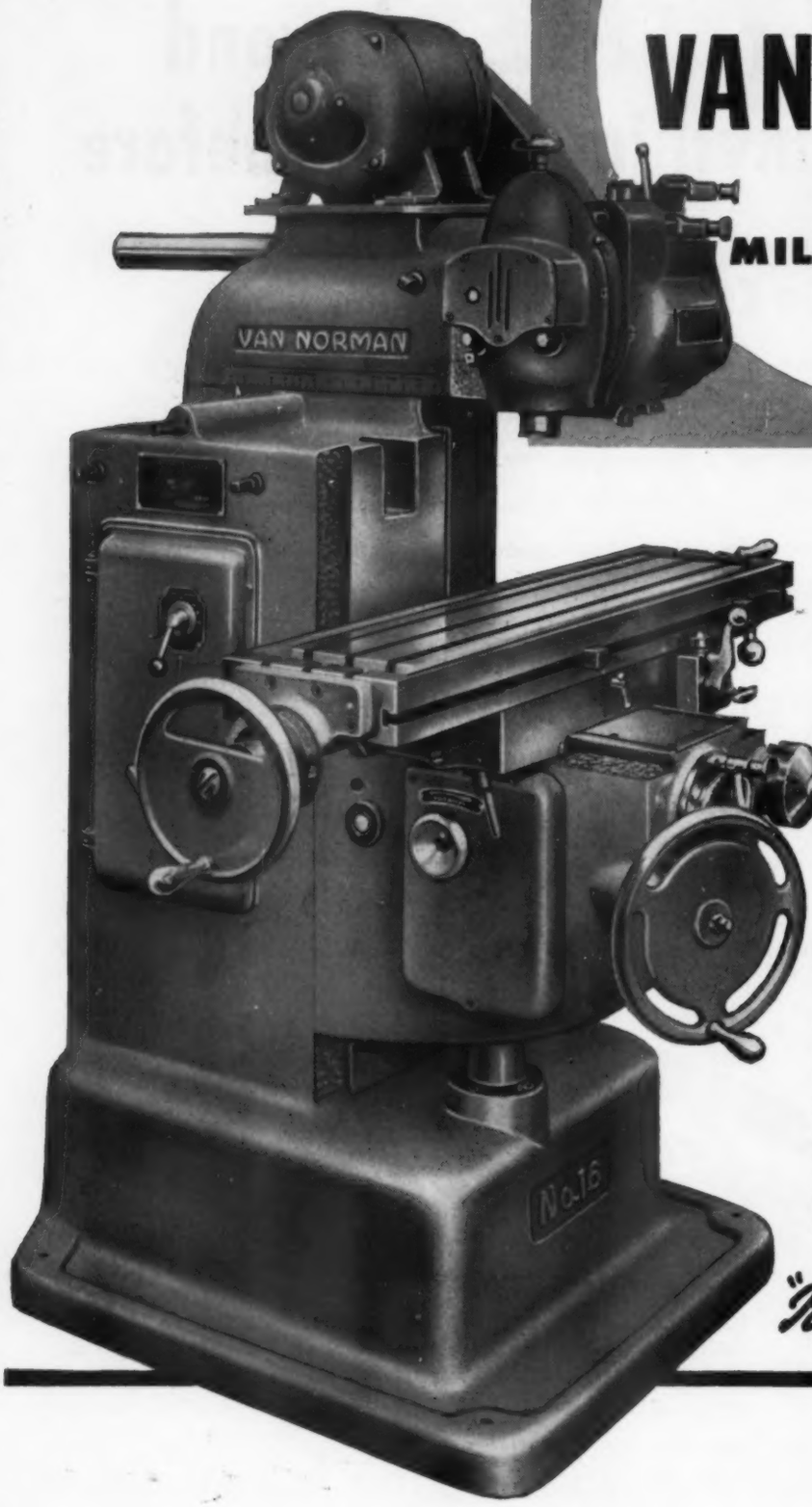
Fellows

THE FELLOWS GEAR SHAPER COMPANY
Head Office and Export Dept., Springfield, Vermont. Branch Offices: 616 Fisher Bldg., Detroit 2. 640 West Town Office Bldg., Chicago 12. 7706 Empire State Bldg., New York 1.

GEAR MEASURING AND INSPECTION INSTRUMENTS • PLASTICS MOLDING MACHINES

The New No. 16 VAN NORMAN

RAM TYPE MILLING MACHINE



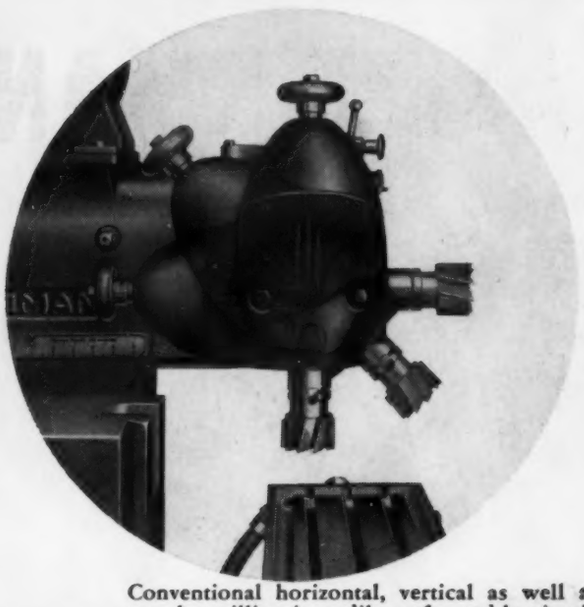
This new versatile No. 16 miller incorporates many outstanding and exclusive features not found in a single purpose machine. The adjustable cutterhead permits conventional horizontal and vertical, as well as angular milling, on *one machine.* It saves time by permitting most jobs to be completed on one machine instead of being moved from one miller to another.

Other cost reducing features include spindle speeds up to 2000 rpm... single lever built-in controls "start" and "stop" spindle, coolant flow and table longitudinal feed... quick, easy ram adjustment ... exclusive Van Norman speed and feed selectors... one-shot metered lubrication ... hardened alloy steel gears.

It will pay you to investigate the new Van Norman No. 16 Ram Type Milling Machine for use in the tool room, pattern shop, die and mold shop, experimental laboratory. It will reduce over-all work completion time, cut costs and increase work output.

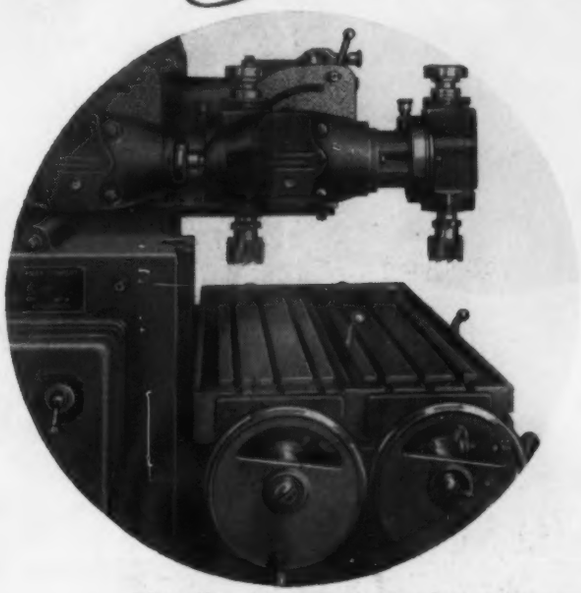
"It pays to Van Normanize"

Featuring...



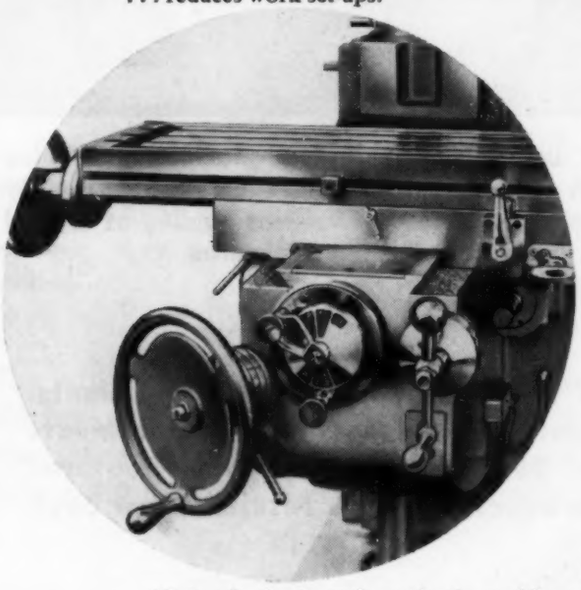
Adjustable Cutterhead

Conventional horizontal, vertical as well as angular milling is readily performed by simply positioning and locking the cutterhead in the desired position. This feature gives you the work range of several single purpose millers . . . reduces work set-ups.



Increased Range

The adjustable cutterhead and movable ram in combination with the saddle cross feed increase the work range and capacity of the machine. Permits a larger variety of work to be handled by this milling machine.



Conveniently Grouped Controls

All hand wheels and cranks for saddle cross feed and knee vertical feed as well as table longitudinal power feed are conveniently grouped in front of knee. Power feeds are easily selected with the quick change feed selector.

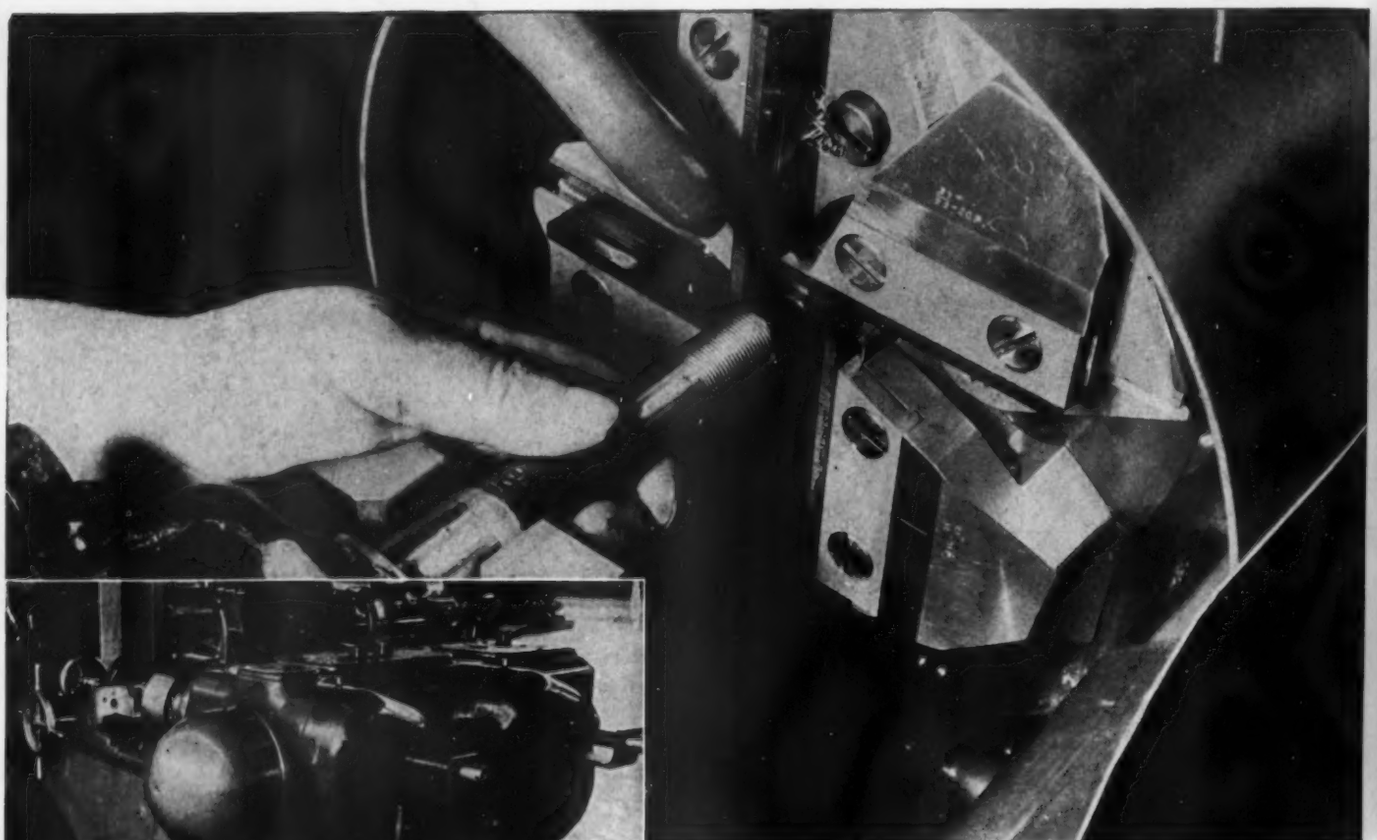
Single Lever Electrical Controls

A single lever controls spindle, feed, and coolant. By merely positioning this lever the operator can start the spindle only, start spindle and coolant flowing . . . spindle and feed . . . or start spindle coolant and table longitudinal feed. The same lever reverses the operations.

VAN NORMAN COMPANY

SPRINGFIELD 7, MASSACHUSETTS

For Precision Threading the Automotive



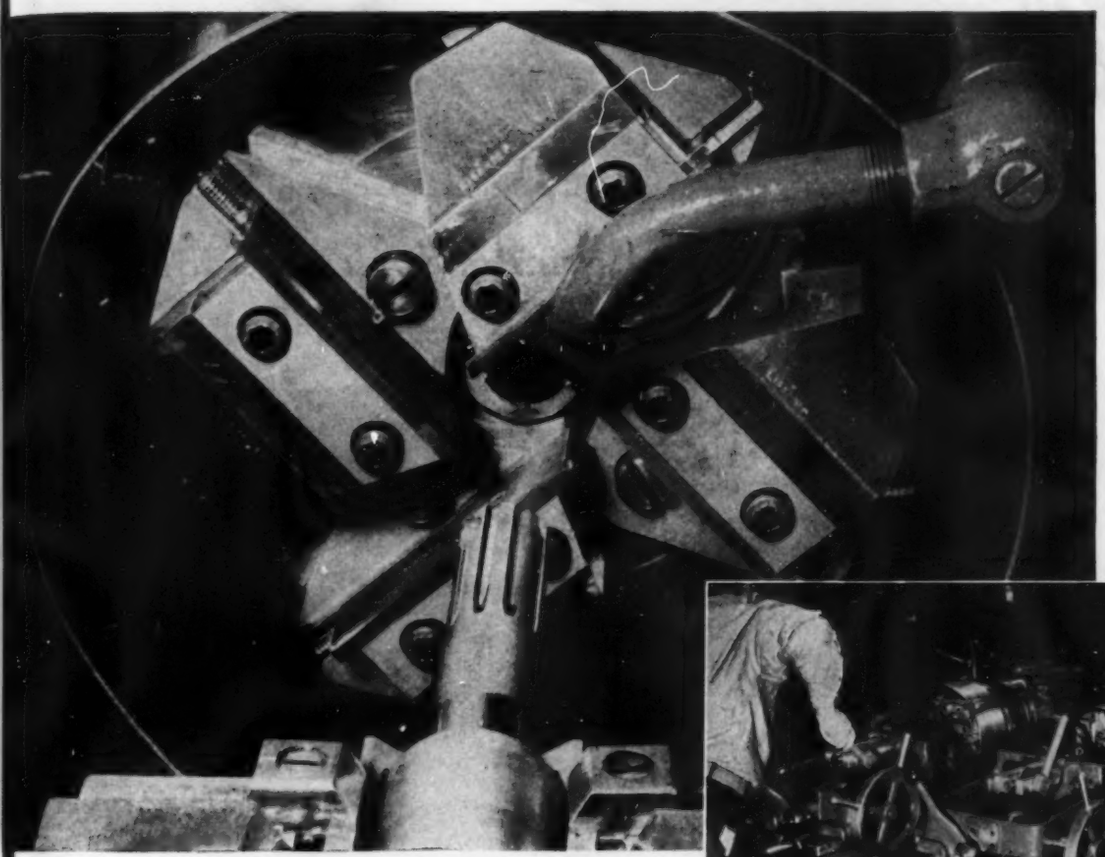
The Landmaco Threading Machine threading truck steering knuckles. Threads must be exactly right to assure the permanent holding of a vital part in a truck steering mechanism.

LANDIS THREADING MACHINES are used extensively in automotive plants. Accuracy is of prime importance. Threads must meet the most rigid requirements and must conform exactly to specifications. Besides accuracy, other features are—economy, ease of operation and high productivity with resultant low cost.

LANDIS MACHINE COMPANY

WAYNESBORO · PENNA · U·S·A·

at Low Cost - - -
Industry Chooses LANDIS



The Landmaco Threading Machine threading spiral hypoid drive pinions. These pinions must be precisely made for perfect assembly, as, once assembled, they are never expected to require attention.

The widespread use of Landis Threading Equipment throughout the automotive industry—where threads must be held to closest tolerances—is just another proof that thread production throughout all metal industries can be safely and economically handled by Landis Threading Machines and Die Heads.

THREAD CUTTING MACHINES • PRECISION THREAD GRINDERS

THREAD CUTTING DIE HEADS • COLLAPSIBLE AND ADJUSTABLE TAPS

"Engineered Grinding Service"

Saves Special Machine Cost ..... Gives Faster Delivery

by modifying a standard grinder for a special job

Modified 6" x 18"
CH Plain Hydraulic Grinder

EQUIPPED WITH MICROSPHERE BEARINGS

LANDIS TOOL

Precision Grinders

Grinding hydraulic pump cams

Off center work holding fixture

Hydraulic rapid infeed – Bed mounted work locator

STANDARD FEATURES

Two Speed Hand Traverse
Microsphere Bearings
Hand or Automatic Wheel Feed
Dual Cylinder Hydraulic Traverse

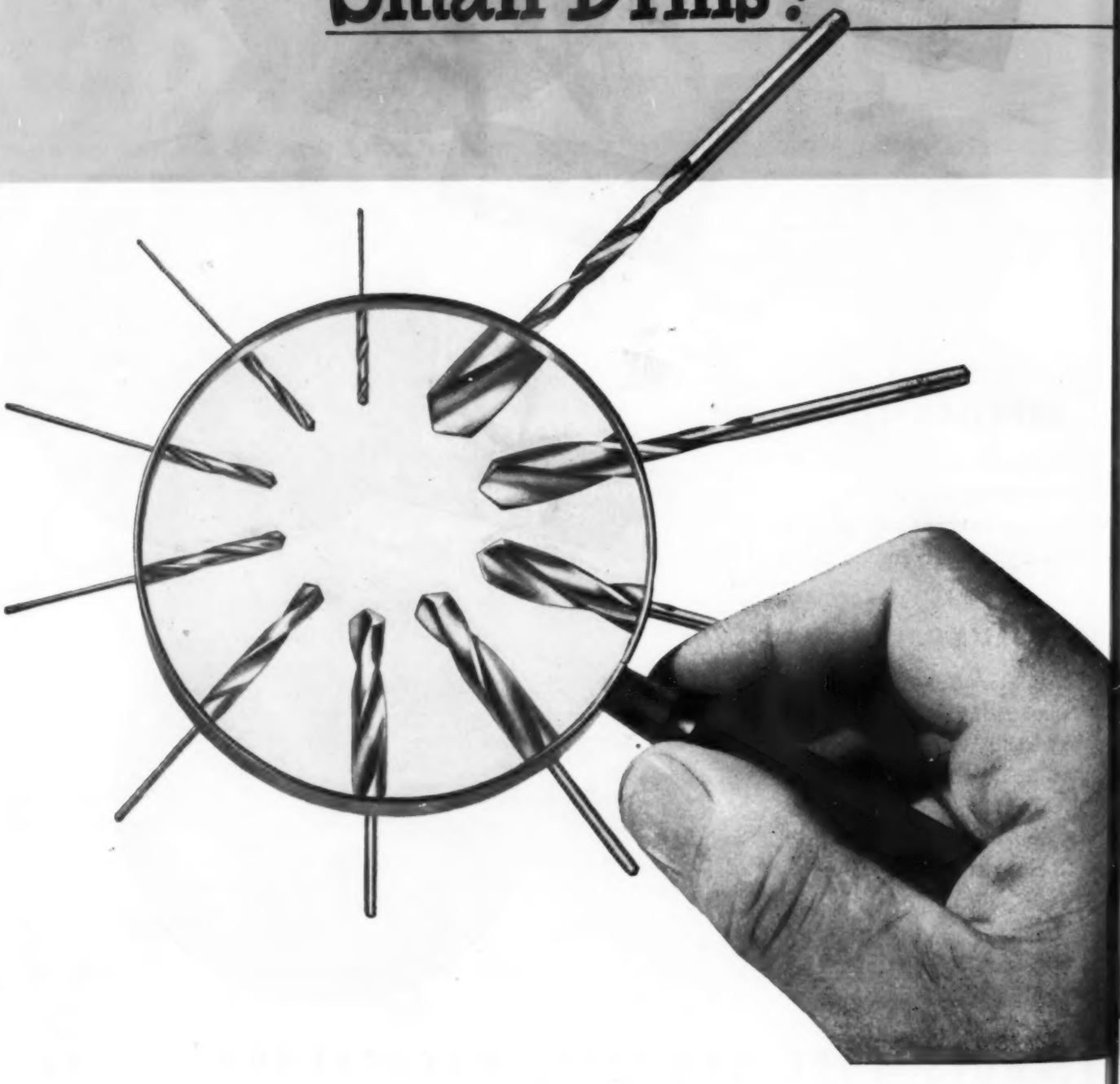
SPECIAL MODIFICATIONS

Off Center Work Holding Fixture
Visual Sizing
Hydraulic Work Holding
Live Spindle Headstock
Reciprocating Mechanism
Hydraulic Rapid Infeed
Bed Mounted Work Locator

Visual Sizing

LANDIS TOOL COMPANY, WAYNESBORO, PENNA.

Magnifying Glass Shows Clue to Lower Costs with Small Drills!



Morse "Multi-Inspection-Test-Control"

Provides Peak Small Drill Quality for ACCURATE Hole Size

We've placed these little fellows under the magnifying glass for a better look. Morse checks and tests and checks again, at every step of the manufacturing process. When a drill has been okayed by the Morse multi-inspection system, the user is certain of a small drill made to the closest tolerances — a tool that's dimensionally accurate with just the right degree of hardness and toughness — a drill that's scientifically ground and precision pointed.

Remember too, Morse small drills are *double-drawn* for increased toughness while maintaining their predetermined degree of hardness . . . and given special heat treatment to assure uniformity. Result: tools that appreciably lower small part production costs and step up "line" efficiency via *accurate* size holes drilled faster.

Whether your needs call for "bantam" size drills or the big Morse "block busters," Morse has the tool to cut down your costs. Your Industrial Supply Distributor can aid you in obtaining the proper Morse recommendation for *your* job on small or large drills and other high quality cutting tools.

Accuracy, Quality, Uniformity: the MORSE Code of Cutting-Tool Manufacture

MORSE TWIST DRILL & MACHINE COMPANY

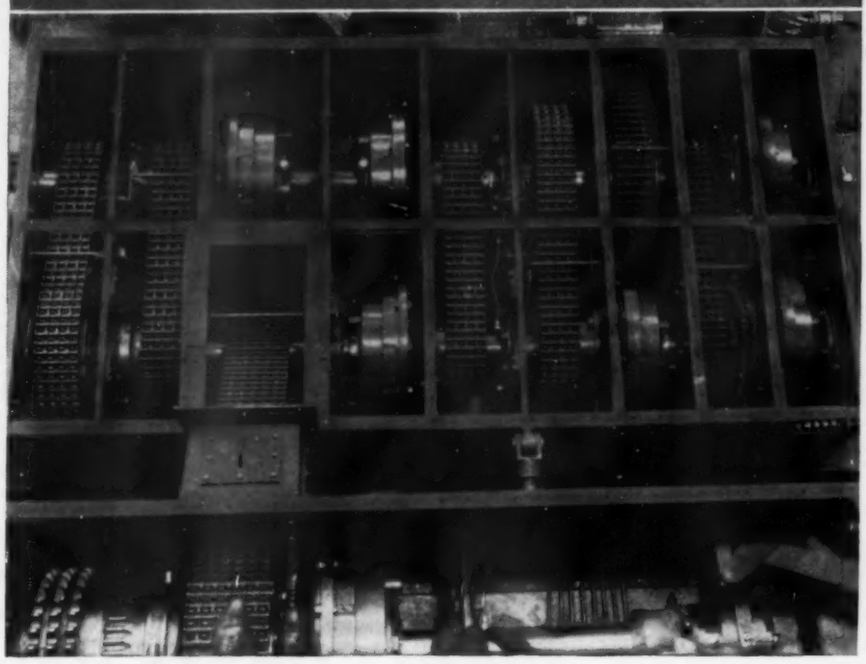
The Original Manufacturer of Twist Drills

NEW BEDFORD, MASSACHUSETTS

New York Store: 130 Lafayette St. • Detroit Store: 2952 East Grand Blvd. • Chicago Store: 570 West Randolph St. • San Francisco Store: 1180 Folsom St.

THE COMPLETE LINE OF LINK-BELT POWER TRANSMISSION MACHINERY

For Efficiency . . . *and Long Life* . . .



LINK-BELT *Silverlink* ROLLER CHAIN

Performance on every type of equipment and in every industry proves the high quality of Link-Belt Silverlink Roller Chain, incorporating the "know-how" of the world's leading producer of chain. Great strength in relation to weight, stamina to withstand shock loads, and smooth, positive, flexible operation are reasons for choosing Link-Belt Silverlink for the widest variety of conveying and power transmission functions.

It assures positive application of power which means perfect timing and coordination of machine operations. Shafts in any number, in any arrangement, can be given either direction of rotation, on long or short centers.

From the smallest size to the largest, it is a precision product. Furnished to manufacturers' (A.S.A.) standard sizes in single and multiple widths, to meet all requirements.

Let Link-Belt chain specialists aid you in applying Link-Belt Silverlink, where efficiency and long life count, for power transmission or conveying.

LINK-BELT COMPANY

Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Dallas 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8.
Offices, Factory Branch Stores and Distributors in Principal Cities.

10,000

LINK-BELT

Power Transmission Machinery

DANLY Special Purpose Straight-Side Presses

PERMANENTLY inclined to 23 degrees, this eccentric gear press shows one example of the adaptations of Danly Straight-Side Presses which can be built to fit your needs. The frame is of four piece tie rod construction. Its clean modern design facilitates rapid loading and unloading and easy scrap removal.

Large square back gibs provide an ample bearing surface to keep the slide in perfect alignment. Air cylinders enclosed in the uprights adequately counterbalance the weight of the slide, gear train and dies.

Danly Circulating Filtered Oil System brings the *right amount* of clean, pump-driven, filtered oil to all gears, bearings and driving members in the crown and slide, *including the flywheel bearings*. Lubricating the flywheel bearings in this way makes it unnecessary to manually lubricate this member at the top of the press.

Safety is assured by the fully enclosed construction of this press, by the two-wire electric control system, and by Danly's cool running air friction clutch which provides instant starting and stopping of the driving machinery.

You can get further information on the type of press shown here or on any one of a complete line of Straight-Side Presses by writing or calling Danly's Press Division.

DANLY

MACHINE SPECIALTIES, INC.

2100 S. 52nd Avenue, Chicago 50, Illinois

The Press for Modern Production

dial any speed . . .

At the twist of a dial, the new Tri-Clad Type ACA induction motor will operate at any speed over a 3 to 1 range! What's more, it will do it while running on alternating current – without any converting equipment or mechanical devices whatsoever. It changes speed quickly and smoothly. In fact, wherever an adjustable-speed drive will improve quality or quantity of output, the Tri-Clad Type ACA induction motor may be a simple, economical solution.

for any machine . . .

The list of applications to your right is only a glimpse at the hundreds of potential uses where this new Tri-Clad adjustable-speed motor might well be considered. Its simplicity and ease of installation make it an easy motor to fit to the job. Standardized NEMA dimensions are used so *there are no new mounting problems.* Its overall length is only slightly more than a constant-speed motor of comparable rating. And for the work it does, the Type ACA is one of the lightest motors in its field.

from any location!

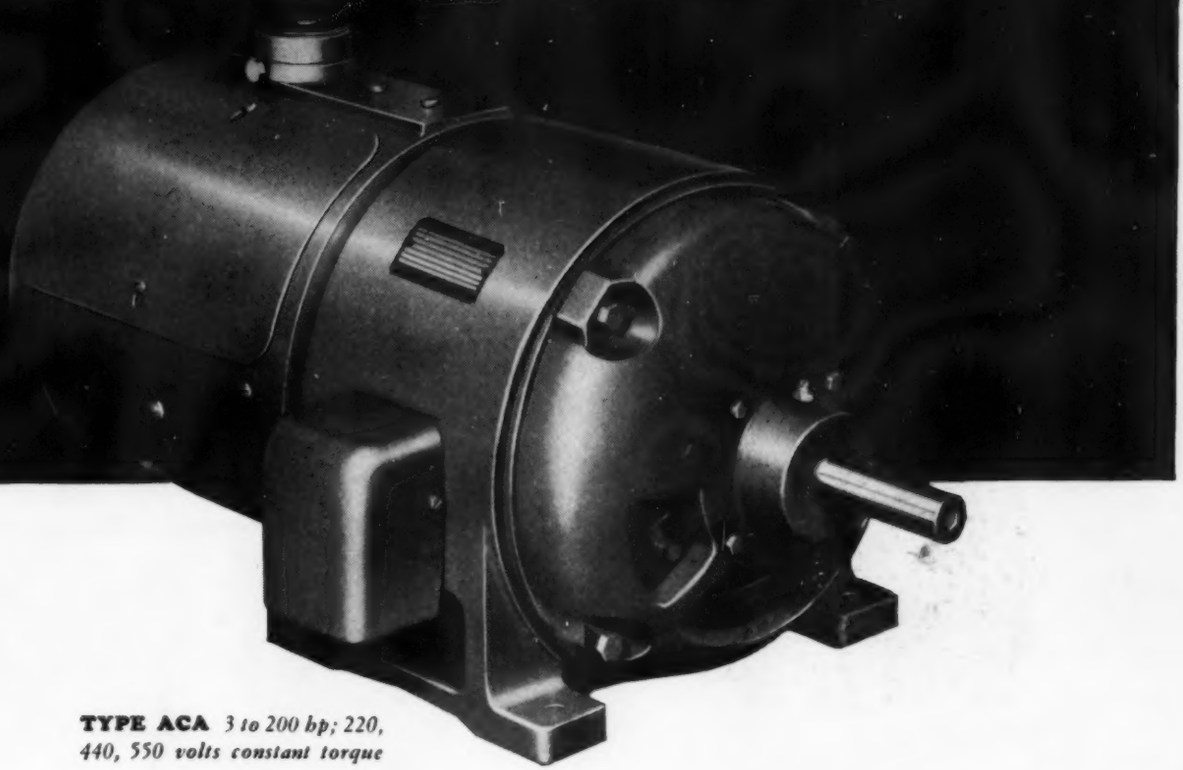
There are few limitations on your choice of location for this Tri-Clad motor, at the present offered in dripproof construction. Famous Tri-Clad construction gives it a sturdy frame for *extra protection* against physical damage; improved winding insulation for *extra protection* against electrical breakdown; and rigid bearing mountings with easy-to-lubricate bearings for *extra protection* against operating wear-and-tear. For remote control, a flexible cable or pilot motor is available. For more information, write today for Bulletin GEA-4883. *Apparatus Department, General Electric Company, Schenectady 5, N. Y.*

GENERAL ELECTRIC

THE NEW TRI-CLAD A-C MOTOR

REG U.S. PAT. OFF.

with 3 to 1 speed range



TYPE ACA *3 to 200 hp; 220, 440, 550 volts constant torque*

HERE'S WHERE TO USE IT!

Textile
- Slashers
- Knitting machines
- Individual finishing machines
- Spinning frames
- Weaving machines
- Printing machines

Chemical
- Shakers
- Grinders
- Pulverizers
- Mixers
- Liquid pumps
- Solids pumps

Food
- Ovens, dryers
- Mixing machines
- Labeling machines
- Grinders
- Centrifugal machines
- Conveyors
- Shaker Screens
- Pumps

Printing
- Job presses
- Coating machines
- Trimming machines
- Stitching machines
- Rotary web presses

Paper
- Winding machines
- Slitters
- Supercalenders
- Coating machines
- Waxing machines
- Embossers
- Other converting machinery
- Stock preparation machinery
- Conveyors

Metal-Working
- Drawbenches
- Lathes
- Stamping presses
- Milling machines
- Grinders

Mining
- Mill feeder drives
- Crusher feeder drives
- Sinter conveyors
- Other conveyors

You can't beat Tri-Clad Extra Protection!

GENERAL ELECTRIC COMPANY, Section F750-293
Apparatus Department, Schenectady 5, N. Y.

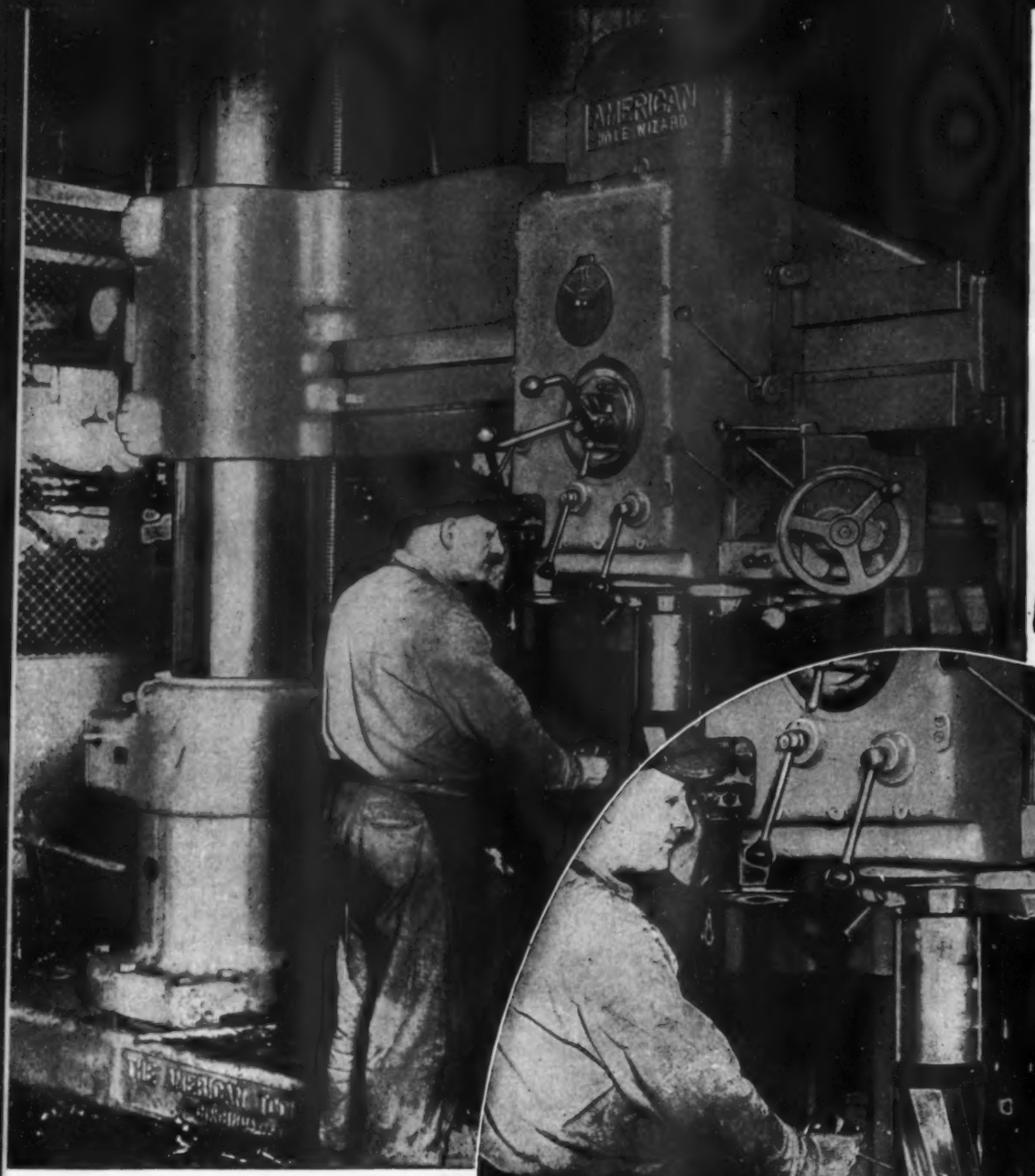
Please send me Bulletin GEA-4883 which describes the new Tri-Clad Type ACA motor:

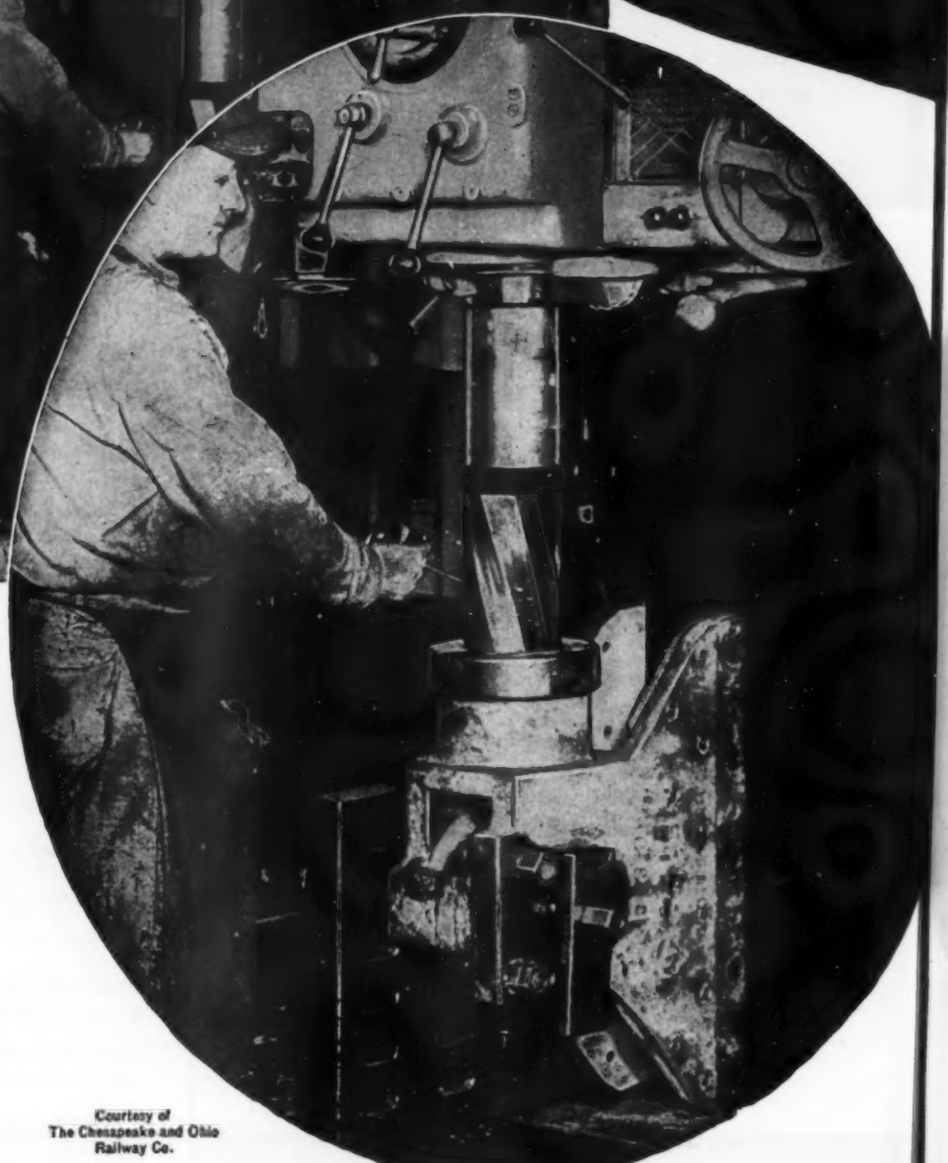
NAME_____

COMPANY_____

ADDRESS_____

CITY_____ STATE_____





Taper reaming locomotive cross heads for piston rod fits.

Courtesy of
The Chesapeake and Ohio
Railway Co.

THE AMERICAN TOOL WORKS C

Acid Test of SPINDLE CONSTRUCTION

Reaming cross heads for piston rod fits is about the toughest job you can find for a radial drill spindle.

This work must be done at slow speeds, without chatter and with a fine finish.

IT'S A TOUGH ONE BUT—

1 **The boring mill construction of the "American" Hole Wizard Spindle does the job. Its 100% anti-friction design with adjustment for wear insures frictionless operation and maintenance of original accuracy.**

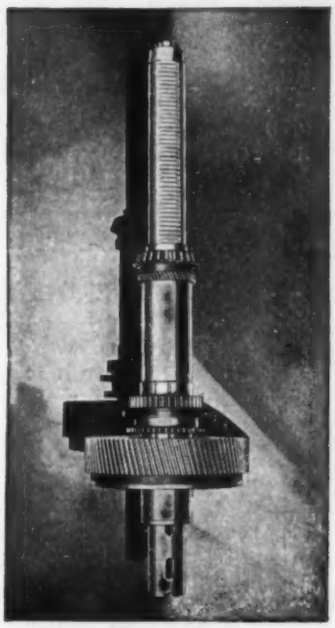
2 **The patented Double Lo-Hung Spindle Drive locates the large diameter driving gear at the bottom of the head close to the work, thus minimizing spindle torque.**

3 **The large diameter spindle, recently increased to add 37% to its rigidity, easily resists the enormous torsional effort imposed by this job.**

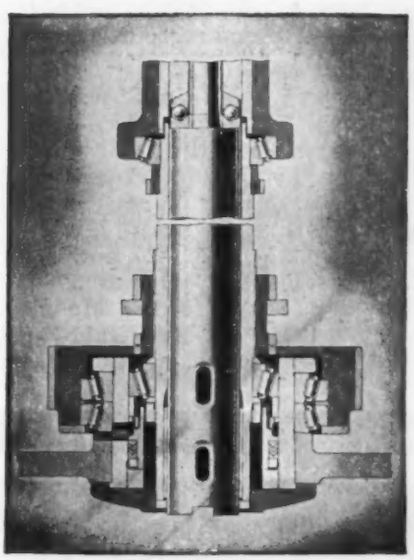
4 **Spindle shake is reduced to an absolute minimum by allowing only .00025" freedom between the ground nitrided spindle and the honed nitrided spindle sleeve. This is especially valuable on accurate boring operations.**

These four spindle characteristics are YOUR assurance that YOUR tough ones will be done easier, quicker and cheaper with an "American" Hole Wizard on the job.

Civilian goods and services must be produced in greater quantities and at lower costs. The "American" Hole Wizard Radial definitely is a contributor to this cause.



Patented Double Lo-Hung Spindle Drive.



Patented Double Lo-Hung anti-friction spindle mounting.

BULLETIN 327 TELLS THE STORY . . . YOURS FOR THE ASKING

Lathes and Radial Drills **Cincinnati, Ohio U.S.A.**

FOUND! NEW WAY T
SET-UP TIME UP T

New Built-In Chuck-Type Milling Machine Table Greatly Reduces Material Handling and Set-Up Time on Hard-to-Hold Workpieces.

A CURRENT SURVEY, made by one of the nation's largest industrial shops, shows that on all its milling operations, 83% of the *total* time was spent on set-up — that only 17% of the time is actual cutting time! The new Kearney & Trecker *Built-In* Chuck Type Table can reduce that high 83% figure up to one-half!

In actual shop tests, workpieces both large and small, simple and complex, have been set-up and machined in fractions of the time formerly required. Equally important, the simplicity of set-ups on these new tables give you greater rigidity and more accurate results every time!

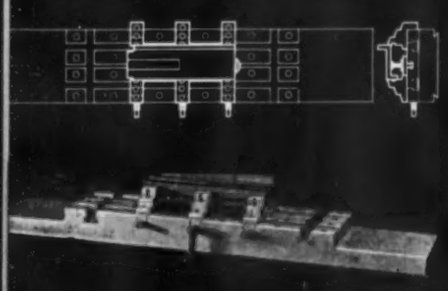
The *Built-In* Chuck-Type Table is available now in three standard working ranges on the following Kearney & Trecker standard knee-type milling machines, plain or vertical styles: (1) 34" power table feed — Models 2K, 3H and 20 CSM. (2) 42" power table feed — Models 3K, 4H and 30 CSM. (3) 50" power table feed — Models 4K, 5H and 50 CSM. Accessories include screw and spring jacks, bumper stops and a variety of interchangeable, reversible vise jaws with hard, soft, plain, serrated, flat or radius faces depending on the surface or material to be clamped.

If you are planning on new milling machine equipment in your shop — it will pay you to get complete details on the new Kearney & Trecker milling machines with the *Built-In* Chuck-Type Table. Contact your nearest Kearney & Trecker Office or Dealer, or write direct to Kearney & Trecker Corporation, 6784 W. National Ave., Milwaukee 14, Wis.

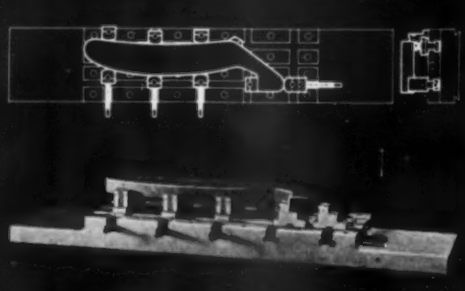
KEARNEY & TRECKER
MILWAUKEE
MACHINE TOOLS

SEE THESE EXAMPLES OF HOW TYPICAL SET-UPS ON NEW

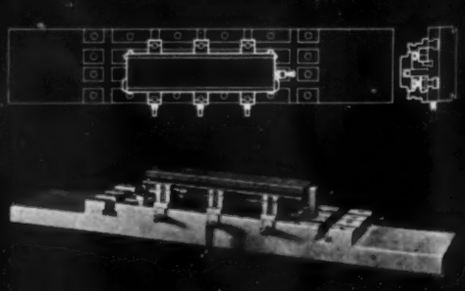
AVERAGE SET-UP TIME: 15 MINUTES



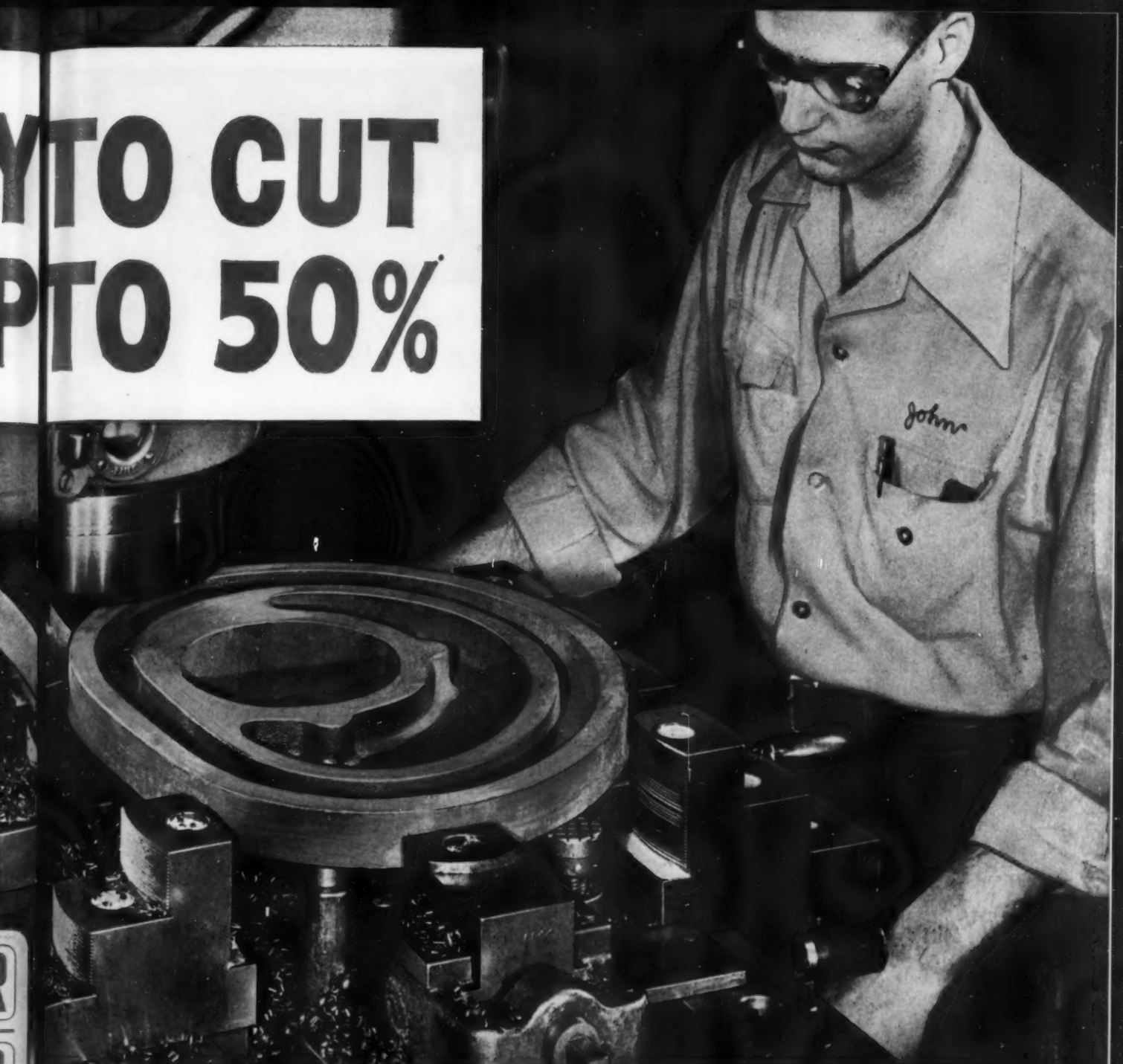
AVERAGE SET-UP TIME: 25 MINUTES



AVERAGE SET-UP TIME: 15 MINUTES



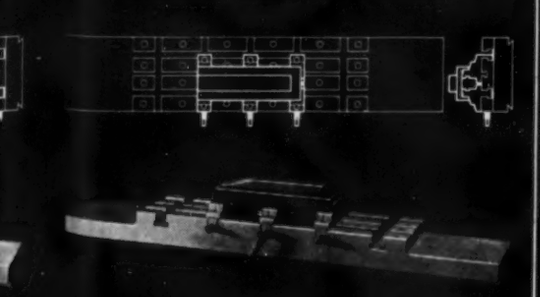
Y TO CUT
P TO 50%



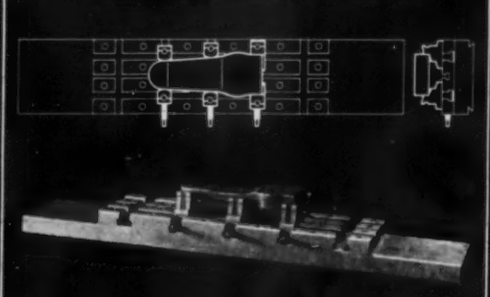
re's a simple, rigid set-up for carbide milling on an air-hardening tool steel face cam. Note elliptical shape of work-ce. Set-up time on new Chuck-Type Table — approximately *25 to 30* minutes, over 50% faster than old method!

EW CHUCK-TYPE TABLE SAVE TIME... GIVE GREATER RIGIDITY

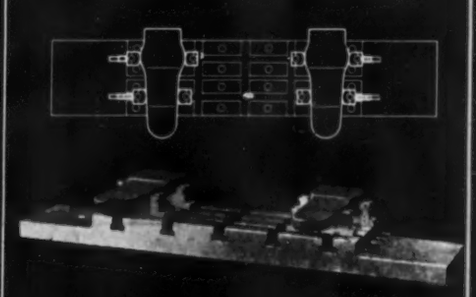
AVERAGE SET-UP TIME: 12 MINUTES



AVERAGE SET-UP TIME: 15 MINUTES



AVERAGE SET-UP TIME: 20 MINUTES



32 ALUNDUM®

Heavy Feed . . . . Safe, Cool Cut
Less Dressing . . . Long Production Life

The unusual characteristics of this new, single-crystal abrasive make it especially effective for all types of surface grinding — even for grinding large, flat areas of hard, tough alloy steel.

Wheels, cylinders and segments of "32" are smashing many surface grinding records because of their ability to take heavier cuts without burning. The single, complete crystals — produced by an entirely new process and over 99.6% pure useable abrasive — have many sharp cutting points **on all sides.** These sharp nubs — which resist dulling because of their high purity — act as **spearheads** for the main crystals and enable a faster, cooler penetration of the metal, heavier feeds, and faster production.

If you haven't tried 32 ALUNDUM grinding wheels for your surface grinding jobs, get in touch with your Norton abrasive engineer or your Norton distributor today.

W-1160

NORTON ABRASIVES

Abrasives · Grinding Wheels · Grinding and Lapping Machines · Refractories · Porous Mediums · Non-slip Floors · Norbide Products · Labeling Machines

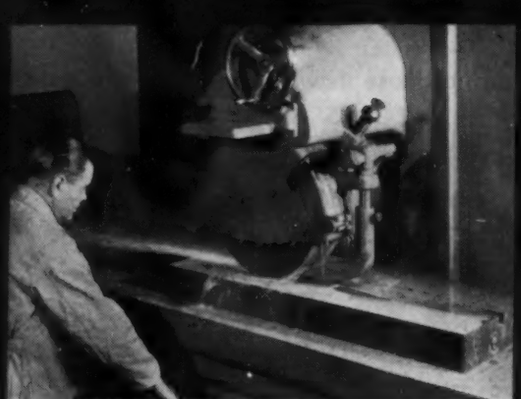
. . . Outstanding for SURFACE GRINDING!

Hardened Alloy Steels

"32" wheels permit a feed **2 to 4 times heavier** than commonly used, because the singularly sharp, nubbly grains provide more cutting points. Suggested specifications: 32A60-F12VBEP or 32A46-H8VBE.

Hardened Steels

The unique, nubbly surface-sharpness of 32 **Alundum** grain insures less frictional drag and promotes a **safer, cooler-cutting action.** Suggested specifications: 32A46-I8VBE or 32A46-J5VBE.



Large Steel Parts

The long-lasting and fast-cutting properties of "32" abrasive enable these wheels **to stay sharp longer,** promoting accurate dimensional control of large flat areas. Suggested specifications: 32A36-J5VBE or 32A36-G12VBEP.

Hardened Die Blocks

The unique surface-sharpness of "32" crystals, in segments or cylinders, produces a more even grain depth of cut, resulting in the ability to obtain **better finish.** Suggested specifications: 32A36-G8VBE or 32A60-F12VBEP.

NORTON COMPANY, WORCESTER 6, MASS. *Distributors in All Principal Cities*

The R. H. Sheppard Co., Inc.

Puts Precision Internal Finishing

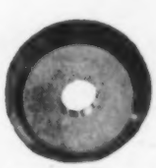
On a Production Basis With

SUNNEN HONING MACHINES

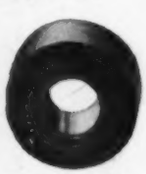
Connecting Rod forging — Hole diameter 1.188", total tolerance, .0005" (five ten-thousandths).

Cast iron piston — Alignment between two holes 1.0625", total tolerance, .0002" (two ten-thousandths). Production 40 pistons per hour.

Bronze fuel injection cylinder — Total tolerance, .00005" (fifty millionths) on diameter of .3125". Production 12 pieces per hour.



Hard steel (60 C scale) governor weight — Total tolerance, .00025" (two and one-half ten-thousandths), diameter .313".



Hard steel (60 C scale) roller — Total tolerance, .0002" (two ten-thousandths), diameter of .2495". Production 40 pieces per hour.

Hard steel (60 C scale) fuel pump cam — Total tolerance, .0002" (two ten-thousandths) on diameter of .250" Production rate 40 pieces per hour.

Sheppard diesel engines are known throughout industry for their dependability, economy and efficiency—achieved by proper design and maintenance of rigid production standards.

On many parts such as those shown here Sunnen Honing holds tolerances as low as .00005" (fifty millionths) or less —at a production rate that is economical in cost.

Here are some of the reasons why Sheppard and many other industrial companies are using Sunnen Honing to produce accurate internal diameters .120" to 2.625":

- Produces straight round holes — accurate to .000025" (25 millionths of an inch)
- Produces any degree of surface finish within commercial limits
- Maintains accurate alignment between tandem holes
- Hones all metals, plastics, ceramics — except lead and babbitt
- Operates without jigs or fixtures
- Low in cost — economical to use

Write today for details—or, on request, a Sunnen engineer will call at your plant.

SUNNEN

TRADE MARK REG. U. S. PAT. OFF. • MARCA REGISTRADA

SUNNEN PRODUCTS COMPANY • **7941 Manchester Ave., St. Louis 17, Missouri**

Canadian Factory: Chatham, Ontario

309

COMMON SENSE ASSEMBLY ENGINEERING

Motorette Body Assembly moves 35% faster with P-K Screws

Thirty-eight P-K Type "Z" Self-tapping Screws are used with "C" Clamps and Tinnerman Speed Nuts to attach body fairings to tubular frame of the Motorette. More P-K Type "Z" Screws are used with Tinnerman Nut Plates to attach floors. When necessary to detach body units, Type "Z" Screws can be removed and re-inserted without affecting security.

● A 35% boost in assembly rate is nice going anytime—and even more worthwhile now, with wage levels mounting.

That's the saving credited by The Motorette Corp. to the use of P-K Self-tapping Screws for attaching body fairings on the smart little vehicle illustrated.

P-K Screws eliminated tapping, along with fussy alignment, tap breakage, wobbly starts, and cross threading. The 35% saving compares favorably with those of 30% to 50% made by thousands of manufacturers who use P-K Screws to avoid tapping, bolting, riveting, and inserts in plastics.

It's plain common sense to see if you can benefit by the money-saving, time-saving advantages of P-K fastenings in your assembly work . . . whether it's in blueprint stage or in production. Seven out of every ten assemblies submitted, have been benefited by the P-K "short-cut" fastening method. Call in a P-K Assembly Engineer—no obligation—or send your assembly details for recommendations. Write Parker-Kalon Corporation, 200 Varick Street, New York 14, N. Y.

Sold Only Through Accredited Distributors

P-K* *Reg. U.S. Pat. Off.

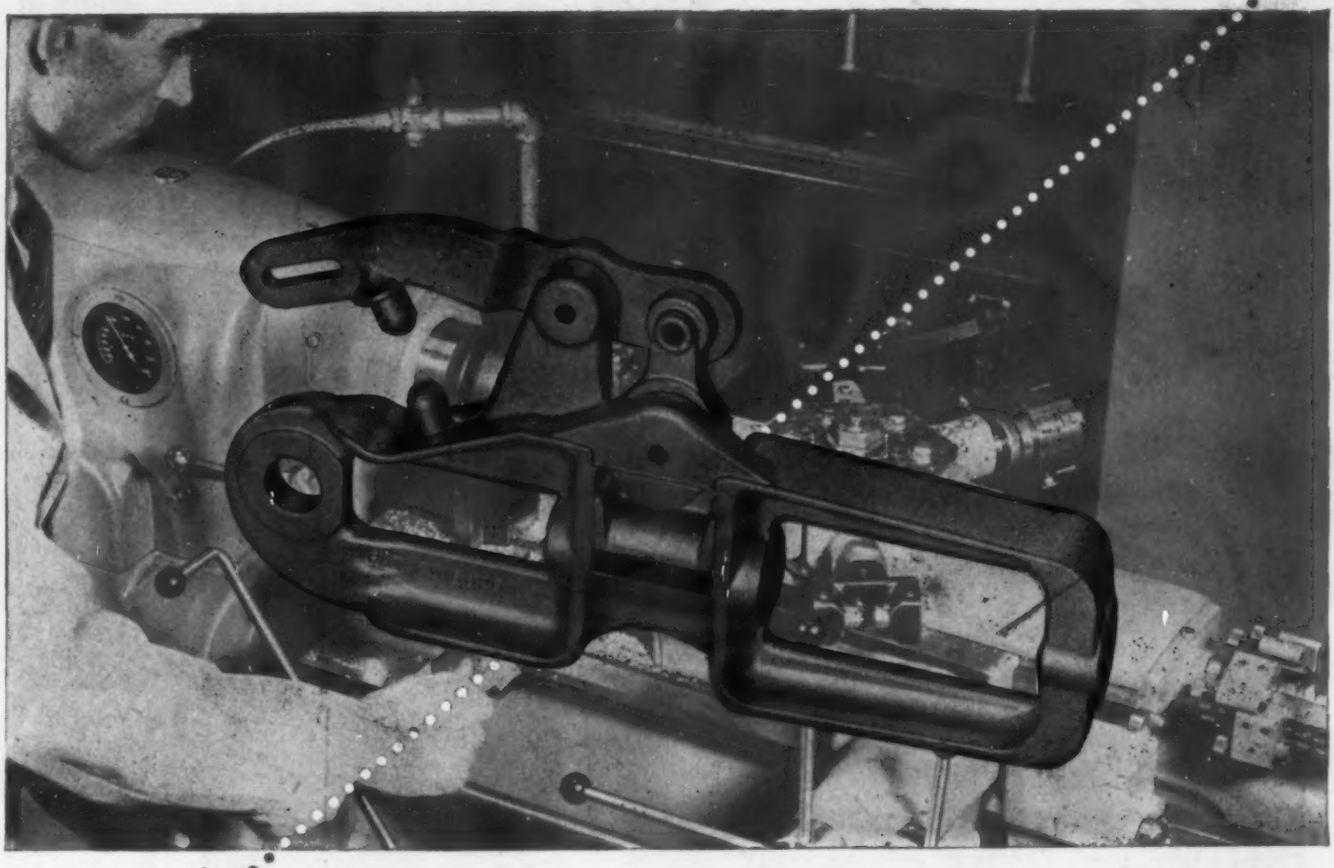
PARKER-KALON SELF-TAPPING SCREWS

FOR EVERY METAL AND PLASTIC ASSEMBLY

OTHER PARKER-KALON PRODUCTS COLD-FORGED SOCKET SCREWS • HARDENED SCREWNAILS AND MASONRY NAILS • SHUR-GRIP FILE AND SOLDER IRON HANDLES • METAL PUNCHES • DAMPER REGULATORS AND ACCESSORIES

REGALS 13"-24"
RAPID PRODUCTION 13"-17"-20"
DUAL DRIVE
RT TOOL ROOM & HEAVY DUTY 12"-16"
SLIDING BED GAP 18"/38", 25"/50", 32"/60"
AUTOMATIC 12"-16"
HEAVY DUTY ENGINE 12"-32"
No. 2 CUTTER GRINDER
UNIVERSAL CRANKSHAFT 26"-36"
HOLLOW SPINDLE 16"-30"
AUTOMATIC CRANKSHAFT
HEAVY DUTY ENGINE 40"-50"
More Lathes mean | Greater Choice Better Buy!
THE R. K. LeBLOND MACHINE TOOL CO., CINCINNATI 8, OHIO
LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES
NEW YORK, Singer Bldg., 149 Broadway
CHICAGO, 20 N. Wacker Drive
PHILADELPHIA, Beury Bldg., 3701 N. Broad
LeBLOND

How to get another machine tool without buying it...



Switch to ALCOA ALUMINUM *die castings!*

Less machining is required when you make parts from Alcoa Aluminum Die Castings. Some of your machine tools can be put on more profitable work than rough-machining poorly-designed castings. Alcoa's suggestions on minor changes in your designs can give you die castings that are more nearly finished when you receive them.

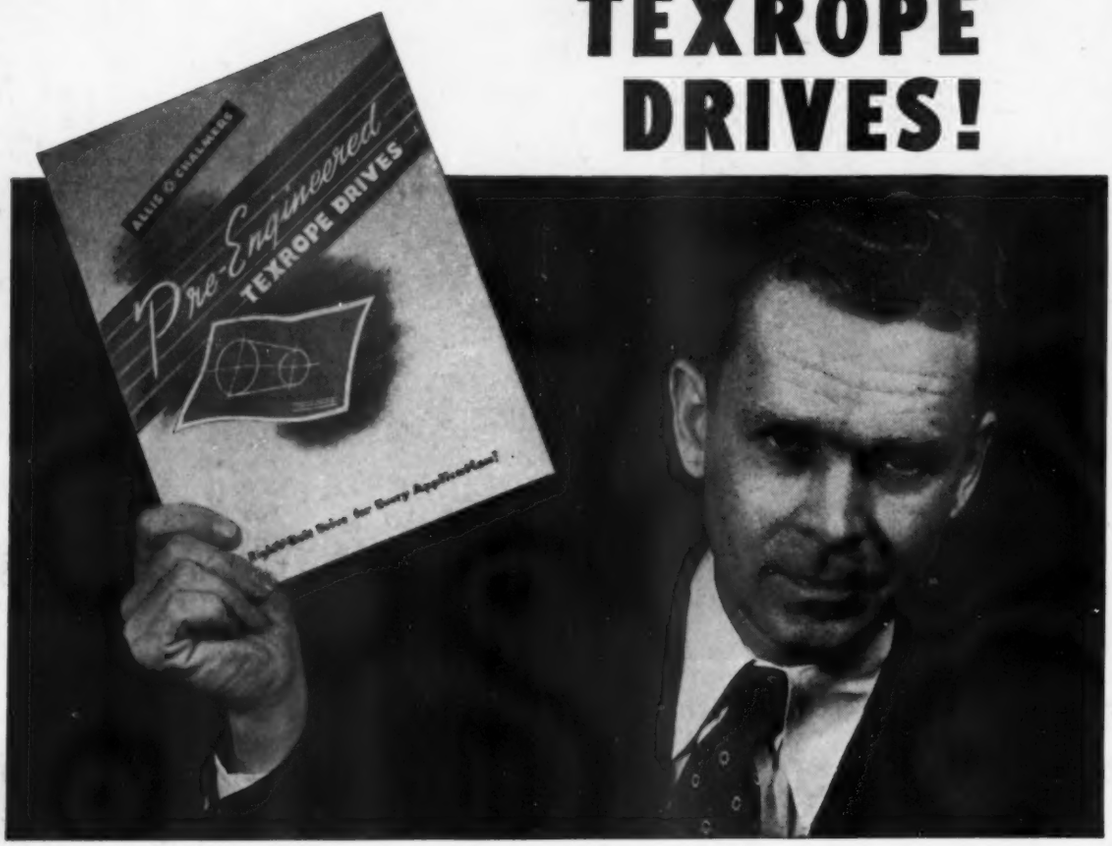
Ask Alcoa for prices on your die-cast parts. Make use of our 32 years of experience in engineering and producing top-quality, lightweight Alcoa Aluminum Die Castings. ALUMINUM COMPANY OF AMERICA, 2107 Gulf Building, Pittsburgh 19, Pennsylvania. Sales offices in 54 leading cities.

ALCOA FIRST IN ALUMINUM

ALCOA ALUMINUM 1888 1948 60 YEARS OF SERVICE

NEW MANUAL PRESENTS

Pre-Engineered TEXROPE DRIVES!



Selects Most Economical Drive for Any Installation!

NEVER BEFORE has specification of the *right* V-belt drive been made so simple, so unerring. You turn to a page, run down a column, and there, in *one place* is the drive you need... number of grooves, diameters of sheaves, size of belt. No turning from table to table, no figuring.

These *Pre-Engineered* stock Texrope drives cover 90% of all requirements. Texrope engineers have carefully selected each one, using economical *stock* belts and sheaves. Each selection is the *one best drive* for a given requirement of power, speed and dimension.

For the few cases not covered by *Pre-Engineered* stock drives, the manual provides complete, carefully arranged engineering data to make it easy to figure special drives.

Now Available . . . 144 pages, indexed, size 8½ by 11 inches. The most complete V-belt drive manual ever published. A book that only Allis-Chalmers can give you. Copies have been sent to many Texrope dealers and users. If you have not received one, write for Texbook No. 20P40. ALLIS-CHALMERS, MILWAUKEE 1, WIS. A 2333

TEXROPE ..Greatest Name in V-Belt Drives

"Super 7" V-BELTS
Five Types — Sizes to suit every power transmission job.

Texsteel, Texdrive, "Magic-Grip"
— sheaves in a full range of sizes, grooves.

"Vari-Pitch" SHEAVES
Exact variations in speed, stationery or motion control.

SPEED CHANGERS
Speed variations up to 375% at the turn of a crank.

ENGINEERING
Finest V-Belt engineering talent in the world—at your call.

TEXROPE "Super 7" V-Belts result from the cooperative research of two great companies — Allis-Chalmers and B. F. Goodrich. They are sold only by A-C.

Texrope, Super-7, Texsteel, Texdrive, Magic-Grip and Vari-Pitch are Allis-Chalmers Trademarks

ALLIS-CHALMERS

One of the Big 3 in Electric Power Equipment — Biggest of All in Range of Industrial Products

A CENTURY OF SERVICE to Industry THAT MADE America Great

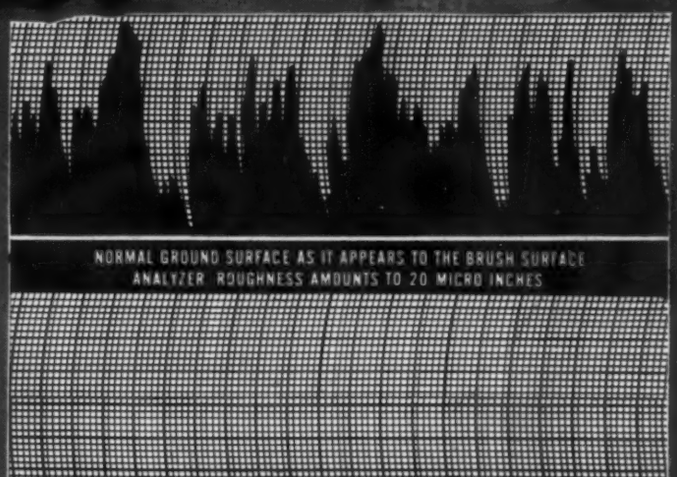
like skating on cinders!

How long could rollers stand this? Not long . . . yet bearings must stand this same kind of punishment with a typical "finished" surface.

There it is, at the right, an actual profile of a normal ground surface as shown by the Brush Surface Analyzer. Look at those ups and downs, and you'll see why bearings wear out before their time.

Now look below at the Brush analysis of a *Superfinished* surface. Smooth? Yes, *seven times as smooth* as the usual ground surface! No grinder scratches, no feed spirals, no chatter marks, no fragmented metal.

Without such defects to rupture the protective film of oil, the life of a bearing has no limit. So it pays to know about Superfinishing . . . and Gisholt engineers are ready with the facts.



NORMAL GROUND SURFACE AS IT APPEARS TO THE BRUSH SURFACE ANALYZER ROUGHNESS AMOUNTS TO 20 MICRO INCHES

BRUSH ANALYSIS OF A SUPERFINISHED SURFACE SHOWS A SMOOTHNESS OF 3 MICRO INCHES

GISHOLT MACHINE COMPANY

1245 E. Washington Ave. • Madison 3, Wisconsin

THE GENERAL PURPOSE SUPERFINISHER is a self-contained unit, simple to operate. Handles a wide variety of miscellaneous or production work. Also available — — specialized machines for all requirements.

THE GISHOLT ROUND TABLE

represents the collective experience of leading specialists in the machining, surface finishing, and balancing of round or semi-round parts. Your problems are welcomed here.

which do YOU need

...A HOB, SHAPER CUTTER, MILLING CUTTER OR BROACH FOR SPECIAL APPLICATIONS?

When they come from Illinois Tool Works they are engineered for *your* application . . . engineered for important "extra" production in *your* machines on *your* job. Over 35 years of toolmaking experience assure you that tools marked "Illinois" always mean greater tool life and lower production costs. So, when you need hobs, broaches, shaper cutters or milling cutters . . . call "Illinois Tool"!

headquarters for engineered cutting tools

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MILLING CUTTERS

HOBS

REAMERS

UNION

SAWS

GROUND FORM TOOLS

TAPS

END MILLS

DIES

GEAR CUTTERS

THE TOOLS YOU BUY AGAIN!

Union can supply the correct tool for almost every job of metal removal—drills that cut cleanly and evenly, cutters that BITE . . . and keep biting. Union tools enable you to take full advantage of the production potential of your machines. Try them on your toughest jobs, and we are sure they'll become—"the tools you buy again!"

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UNION . . . . BUTTERFIELD . . . . S. W. CARD
DIVISIONS OF THE UNION TWIST DRILL CO.

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"Thred-Rite" DIES

Graduated micrometer lock nut adjustment can be set to split thousandths! Full floating design assures accurately centered work! Rugged construction holds accuracy under high speed, heavy duty operation! Use the simple, accurate, efficient "Thred-Rite" Die on jobs where accuracy must be maintained with minimum attention. They are built in a full range of standard sizes, with NC or NF threads, in carbon or high speed steel. Get full details from your nearest Butterfield store.

BUTTERFIELD DIVISION

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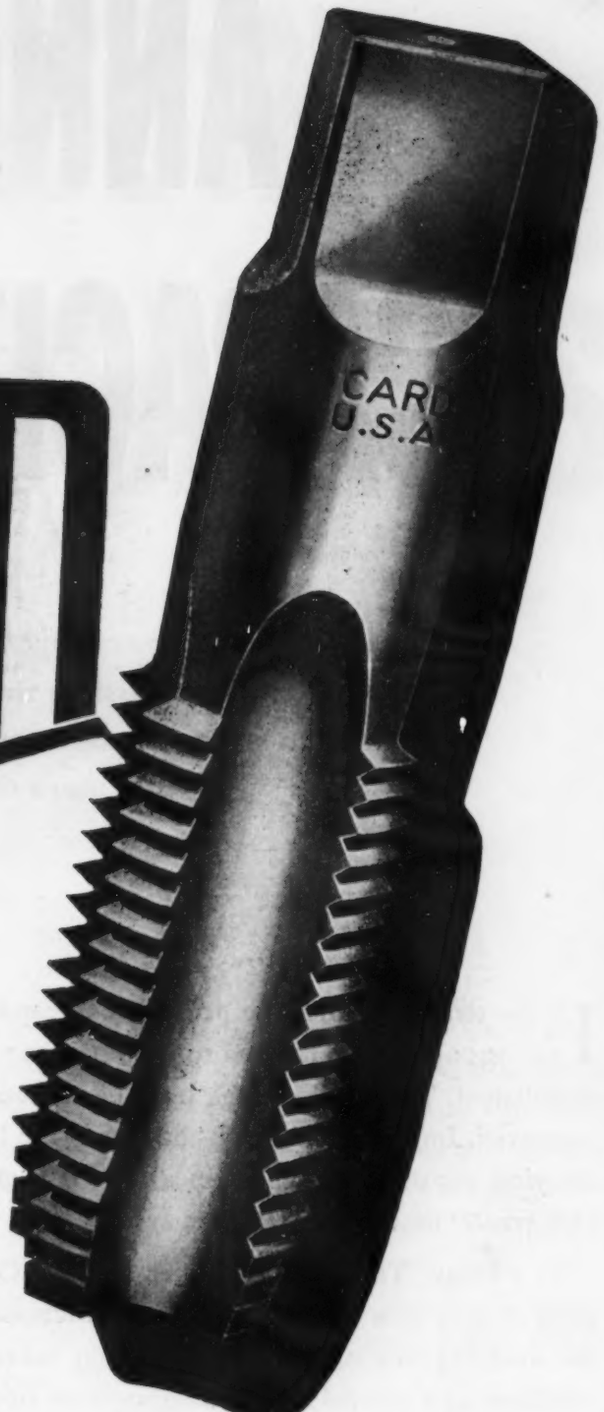
CARD



THE RIGHT ANSWER TO EVERY TAPPING PROBLEM

More and more tap users are specifying CARD for every tapping job. They know that it pays to go to a specialist. They know that they can get the right answer to every tapping problem from this single, convenient, complete source of supply. They know that—in the test of service—Card Taps have given them long runs of threads, high output on all types of materials and under all conditions, and precision results that satisfy their most exacting demands.

S. W. CARD MFG. CO.

MANSFIELD, MASS.

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ANNOUNCING A CAPACITY RATINGS

**Makes possible the use of smaller bearings—
with savings in bearing cost, material cost and weight
—and more compact product design**

IN the ten years since the present load capacity ratings of Timken tapered roller bearings were established, Timken bearings have been steadily improved. Improved so much that today the load carrying capacity of Timken bearings is a good *25% greater* than it was 10 years ago!

As a result, The Timken Roller Bearing Company is now able to announce a 25% increase in the load capacity ratings of all Timken bearings —following a careful review of laboratory studies on fatigue life machines over the past ten years, together with close observation of bearing performance in the field.

Permits Use of Smaller Bearings

Now you can safely carry your present bearing loads on smaller size Timken bearings. Reductions in size of shafts and housings are possible. Products can be made more compact—lighter in weight. You have an opportunity to save both on bearing costs and material costs. And this increase in ratings should enable engineers to utilize the advantages of Timken bearings in an even broader variety of applications than has been practicable in the past.

Result of Constant Quality Improvement

This 25% increase in Timken bearing capacity ratings is based on continued improvement in the quality of Timken tapered roller bearings over the past 10 years. It is due to a number of factors, including improved alloy steels made in our own Timken steel mill specifically for anti-friction bearings, better metallurgical control in the processing of this steel, more accurate manufacturing equipment, greatly improved surface finishes, and more accurate inspection methods. That these improvements in Timken bearing quality have resulted in 25% greater load capacity has been conclusively demonstrated by years of exhaustive laboratory and field studies!

New Engineering Journal to Give Facts

A new Timken Engineering Journal is now in

25% INCREASE IN OF TIMKEN® BEARINGS

The result of years of constant improvement in Timken bearing quality—supported by exhaustive laboratory studies and extensive field experience

preparation which will give complete capacity rating tabulations and will also include new bearings introduced since the last publication. Pending publication of the new Journal you may take full advantage of the 25% capacity increase by multiplying the existing ratings by 1.25.

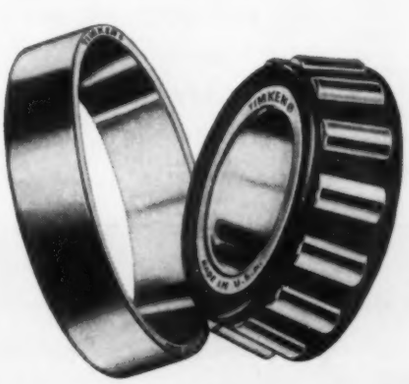
For further assistance in the application of Timken bearings, call upon our field engineers or our Engineering Department.

Timken tapered roller bearings take any combination of radial and thrust loads, hold shafts in rigid alignment, assure precision and minimize friction. The 25% increase in load capacity ratings is the *latest* example of Timken leadership in serving the bearing needs of all industry . . . one more reason why it pays to look for the trade-mark "Timken" on every bearing you use. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

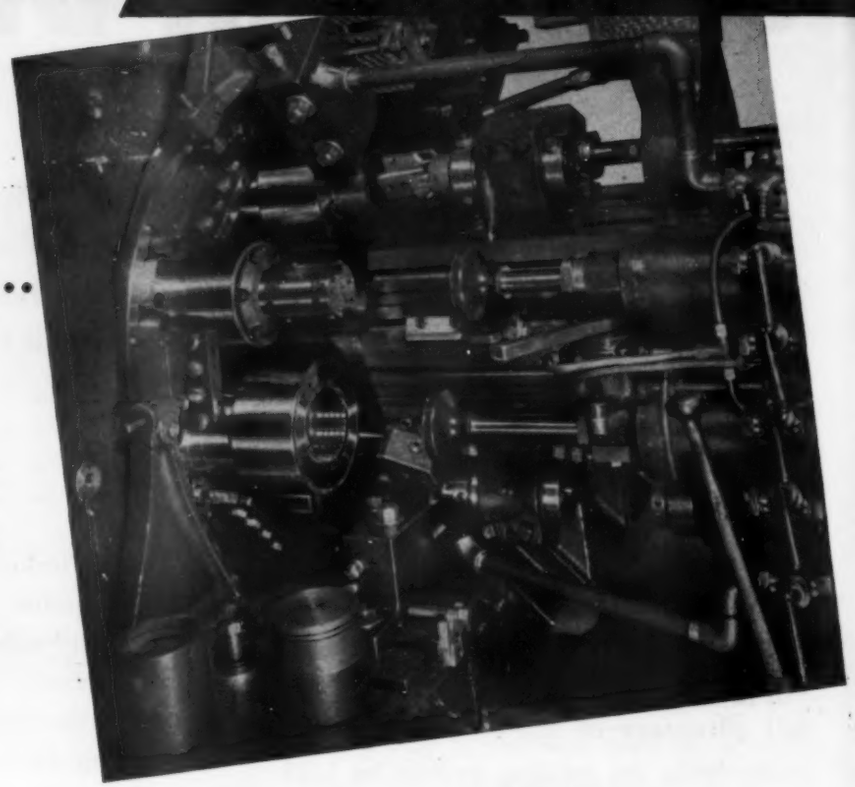
TAPERED ROLLER BEARINGS



NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ▯ AND THRUST →▯← LOADS OR ANY COMBINATION →✳←

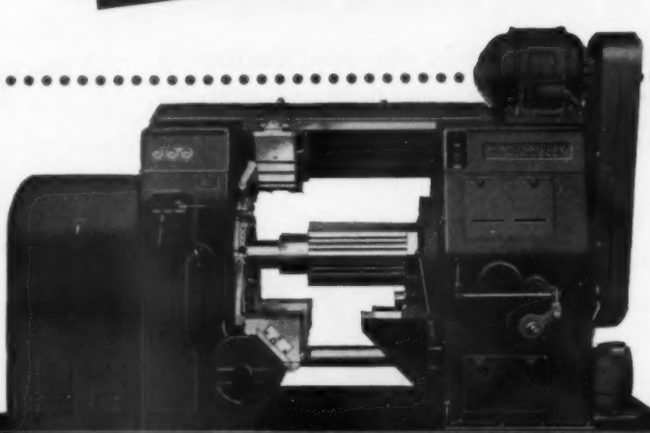
PERFORMANCE

25 OPERATIONS — TOTAL



1st MACHINE
11 OPERATIONS

Double indexing, alternate internal and external chucking. Rough finish both ends of piston, using carbide-tipped tools. Machine time: 12 seconds.



6"—8 SPINDLE ACME-GRIDLEY

Chucking automatic as used on the piston production job pictured.

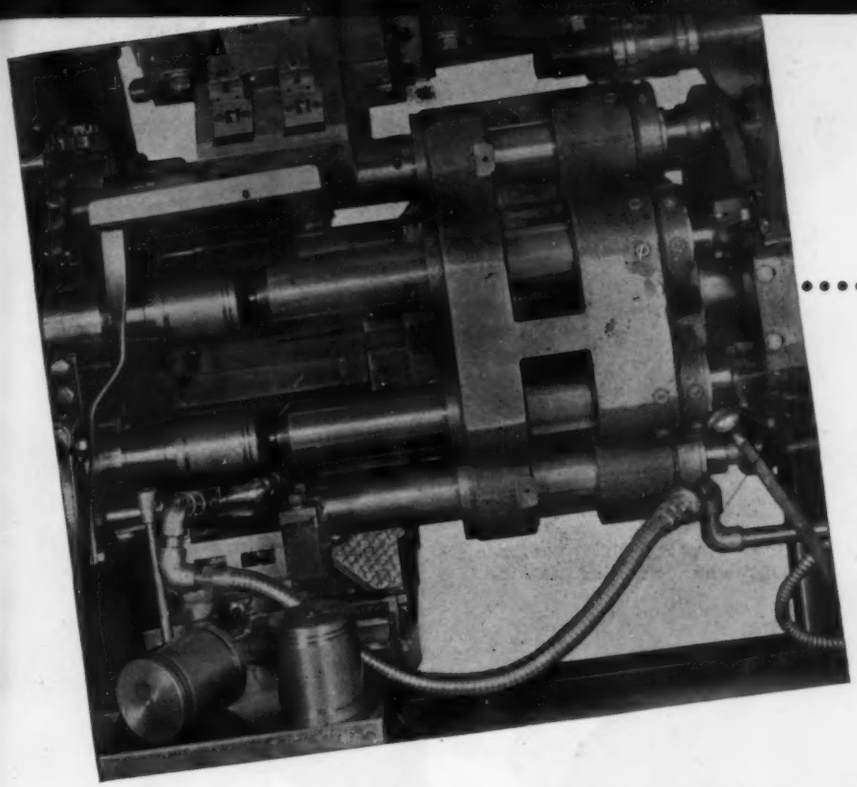
•

OTHER CAPACITIES

10"—4 Spindle
8"—6 Spindle
12"—6 Spindle

PLUS

MACHINE TIME: 28½ SECONDS EACH



2nd MACHINE
14 OPERATIONS

Double indexing with duplicate tooling. Finish 2 pieces at once, using carbide-tipped tools. Machine time for both: 33 seconds (or at the rate of 16½ seconds each).

"HOW MONEY WAS SAVED ON 25 CHUCKING JOBS"
Ask for your copy of this fully illustrated booklet of actual production jobs on Acme-Gridley chucking automatics.

● Now's the time—before obsolete machining methods price you out of a competitive market—to investigate the savings in time, machines and money made possible by Acme-Gridley automatics.

Inherent features of their design are speed, stamina and adaptability. Rugged, box-type frame, plus positive close-coupled, quick-change camming provide a combination that's built for *speed* . . . as fast as modern carbide-tipped tools will take. You can hog off metal without sacrificing accuracy or finish; wide, open tooling zones allow plenty of room for time-saving, power-driven auxiliaries, and for efficient chip clearance.

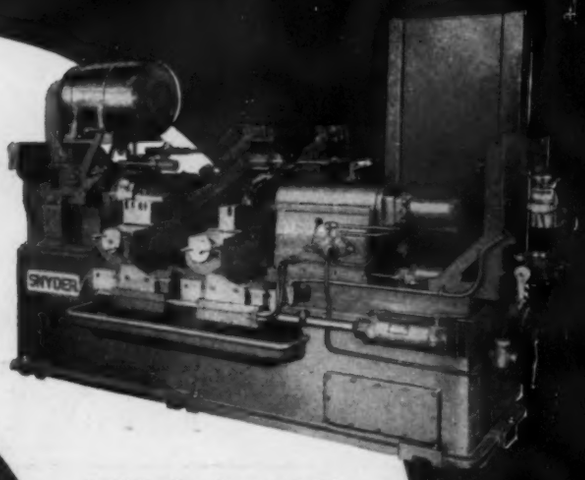
These are some of the *plus* values you get in Acme-Gridley chuckers and bar automatics. They're built for quick change-overs; will up your output on long or short-run jobs. May we show you how?

The NATIONAL ACME CO.

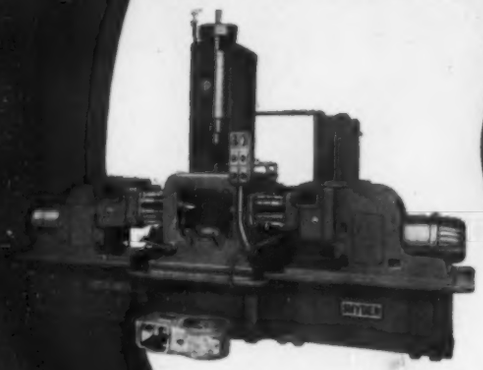
170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley Bar and Chucking Automatics: 1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • The Chronolog-Limit, Motor Starter and Control Station Switches • Solenoids Centrifuges • Contract Manufacturing

57465—Snyder special trunnion-type double-end machine for spot-facing, spot-drilling, hollow milling, threading.

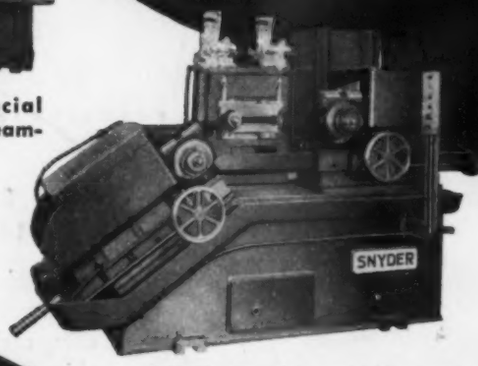


57117—Snyder special hydraulically operated lathe.

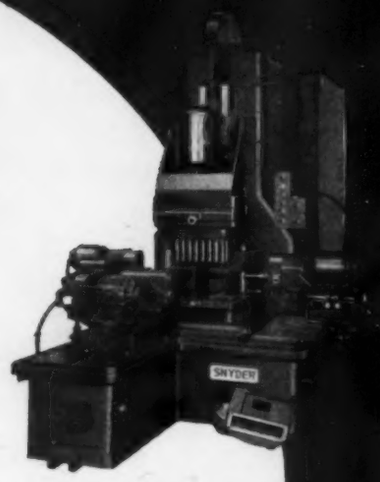


57330—Snyder special 3-way tapping and reaming machine.

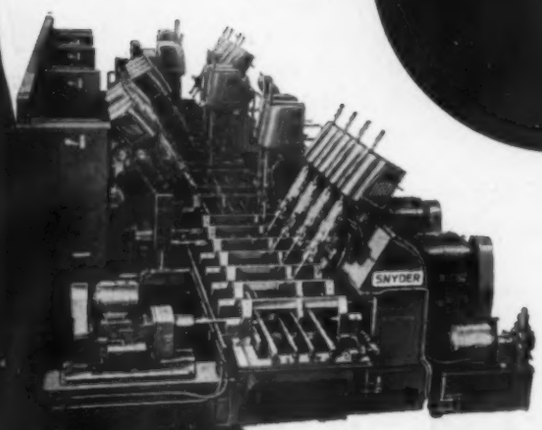
Production economy—in time, work, materials—is the basic answer to many of today's manufacturing problems. Snyder special-purpose machines are built for high production at low unit cost.



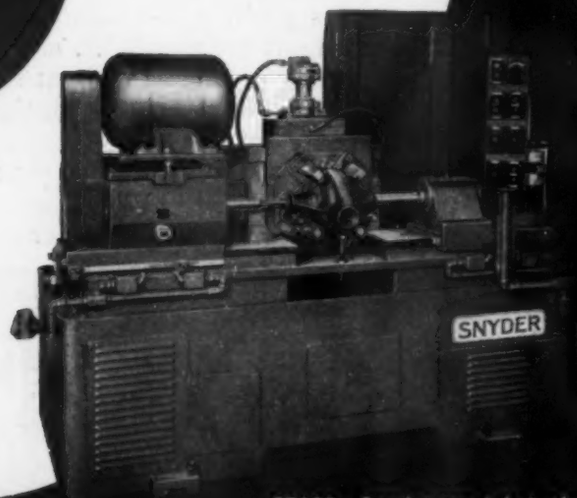
57479—Snyder special connecting rod balance milling machine.



55491—Snyder special hydraulic 5-way drilling machine.



57290—Snyder special in-line type crankshaft drilling machine.



57682—Snyder special single-end, horizontal boring machine for boring gear pockets.

see our CATALOG in SWEET'S FILE

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ARMSTRONG

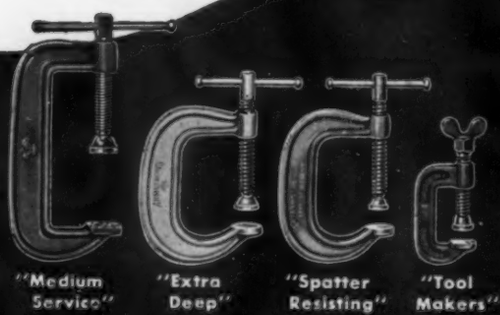
Drop Forged "C" CLAMPS

More Reliable . . .

Every characteristic essential to absolute reliability is built into ARMSTRONG Drop Forged "C" Clamps—maximum strength, extreme stiffness, extra large Tempered and Tested Screws, better "Tool Sense" and design.

That is why it is good policy to standardize on ARMSTRONG "C" Clamps . . .

Your local ARMSTRONG dealer carries them in "Heavy Duty", "Medium Service", "Extra Deep Throat", "Spatter Resisting" and "Toolmakers" designs in a wide range of sizes.



ARMSTRONG BROS. TOOL CO. *"The Tool Holder People"* 5215 W. Armstrong Ave. **CHICAGO 30, U.S.A.**

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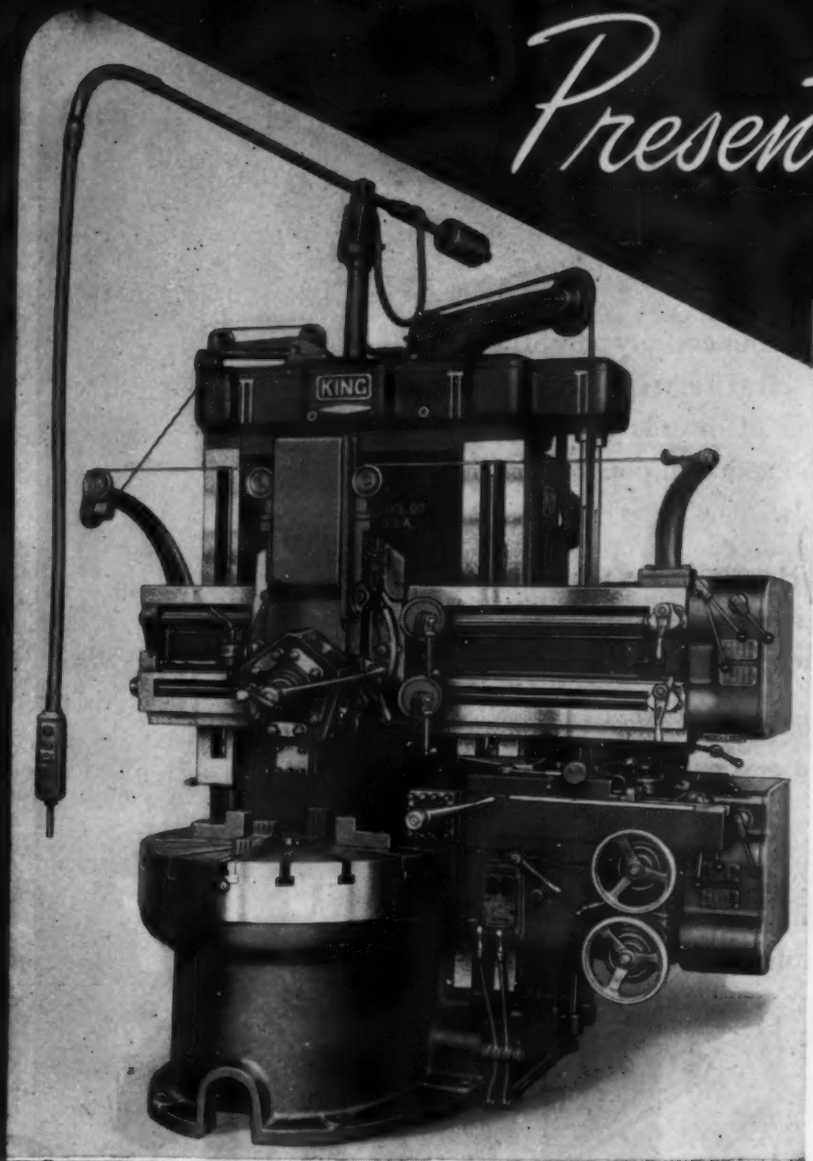
Presenting the...



New Series

KING

42-INCH VERTICAL BORING and TURNING MACHINE

● This King 42 inch New Series Machine is of heavier, more rigid construction throughout and particularly adapted to the use of carbide tools . . . It has more power—a wider range of feeds and speeds—and operating controls conveniently located at the front of the machine . . . Everything as to design and construction points to greater accuracy plus the maximum of production at lowest possible costs . . . Consult a King Engineer on your precision boring and turning operations.

American Steel Foundries

KING MACHINE TOOL DIV.
CINCINNATI 29, OHIO

Builders of Vertical Boring and Turning Machines and Sebastian Lathes

NOT AVAILABLE FROM WAR SURPLUS

This entirely new SIDNEY Lathe with 32 spindle speeds and sixty changes of threads and feeds provides the operator with maximum possibilities from all types of cutting tools.

The continuous tooth Herringbone Geared Head assures smooth, silent transmission of power to spindle resulting in better finish and closer tolerances.

The simplicity and convenience of all operating controls enables operator to get greater production with less fatigue.

For precision—flexibility—and ease of operation make your next lathe a Sidney.

SIDNEY *32 Speed* LATHE

SIDNEY

SIDNEY MACHINE TOOL COMPANY · SIDNEY, OHIO

Builders of Precision Machinery Since 1904

Quick Reference Guide
to lower metal-working costs

Gulf Quality Cutting Oils

GULF LASUPAR CUTTING OIL—for heavy-duty machining operations where exceptionally fine finishes are required.

GULF ELECTRO CUTTING OIL—for heavy-duty machining of tough alloy steels.

GULF M-L CUTTING OIL—for general machining of ferrous and nonferrous metals—noncorrosive.

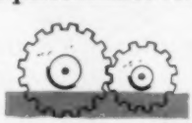
GULF CUT-AID—revolutionary cutting oil for nonferrous metals. Effective energizer for other cutting oils.

GULF CUTX-B—for medium and light duty machining of steel.

GULF L. S. CUTTING BASE—a cutting oil concentrate —can be blended to meet your specific requirements.

GULF THREAD GRINDING OIL—especially developed for use on automatic thread grinding machines.

GULF SOLUBLE CUTTING OIL—offers a new kind of performance for a soluble cutting fluid.



Gulf Quality Lubricants

GULFGEM OIL—the world's finest spindle oil, Alchlor processed.

GULF E. P. LUBRICANTS—for better protection of heavily loaded gears—excellent for tableways.

GULF LUBCOTE—for better lubrication of open gears —ideal for wire rope.

GULF HARMONY OIL—for gear drives, circulating systems where highest quality is required.

GULF PRECISION GREASE AND GULF ANTI-FRICTION GREASE—for better lubrication of ball and roller bearings.

GULF SUPREME CUP GREASE—for lubrication of plain bearings—and anti-friction bearings under wet conditions.

Gulf Quality Hydraulic Oils

GULF HARMONY OIL WCR—for improved performance of hydraulic systems in machine tools and presses.

GULF MECHANISM OIL—for low temperature operation of hydraulic mechanisms.

GULF SOLUBLE CUTTING OIL—forms a stable water-oil emulsion for press systems—prevents corrosion.

Gulf Quality Rust Preventives

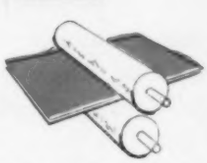
GULF OIL COAT NO. 1, A AND C—prevents corrosion on highly finished metal surfaces between processes and during indoor storage.

GULF NO-RUST C (POLAR TYPE)—displaces residual moisture because of its greater affinity for metals and protects metal surfaces against corrosion.

GULF NO-RUST 1, 3, 4, 5 and 00—petrolatum types for preventing corrosion of metal surfaces exposed to the elements.

Gulf Quality Quenching Oils

GULF SUPER-QUENCH — the revolutionary dual-action quenching oil.



Gulf Quality Metalworking Oils

GULF "C" METAL OIL—for rolling aluminum.

GULF STAINLESS METAL OIL—for drawing, forming and rolling stainless steel.

Gulf manufactures additional products suitable for metal-working operations on many types of metals.

Call in a Gulf Lubrication Engineer and ask him to show you how these quality Gulf oils and greases can help you improve production and reduce operating costs. Write, wire or phone your nearest Gulf office.

GULF INDUSTRIAL LUBRICATION

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Division Sales Offices:

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new Bullard type "K" economies widen scope of MULT-AU-MATIC method

HIGHER SPEEDS, FASTER INDEXING, EASIER CHUCKING REDUCE TIME ON AND BETWEEN CUTS

Demand for a BULLARD Mult-Au-Matic capable of lowering production costs of small and medium sized jobs in cast iron, steel and light metal alloys such as aluminum and magnesium is now met by the addition of the new Type "K" to this versatile line of cost-saving machines.

Higher Speeds Meet New Job Requirements. Providing spindle speeds up to 900 rpm, the new Type "K" gets full productive capacity out of modern cutting tools. The wide range of available spindle speeds makes it adaptable for machining many different kinds of materials in sizes within its chucking capacity.

Saves Time Between Cuts. A newly developed index control mechanism permits faster return and advance of tool carrying heads and faster carrier index, materially reducing lost time between cuts.

Higher Degree of Accuracy. New method of carrier index registry insures maintenance of repetitive accuracy from station to station. This results in producing work to close tolerances in keeping with present-day requirements.

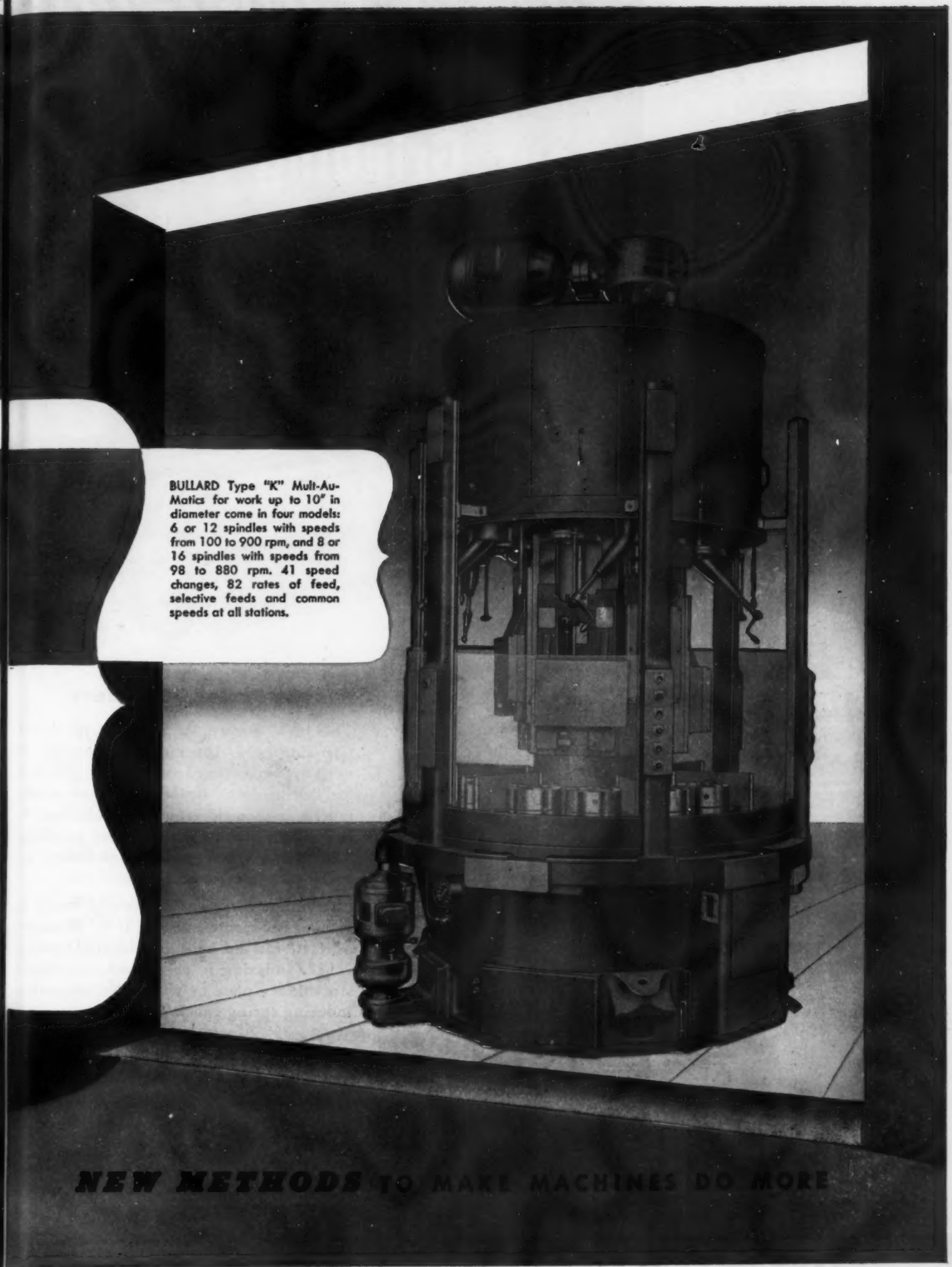
Improved Hydraulic Chucking Increases Efficiency. Work is chucked quickly by means of a foot treadle control and is automatically released when spindles are returned to loading station. Chucking pressure may be regulated to suit work characteristics.

Twin Spindles Double Production. To the four economies just described, common to all *four* Type "K" models, the twin-spindle models add the extra advantage of delivering two finished pieces for every index cycle. This promise of lower production cost is worth investigating further.

Many other advantages are inherent in the new Type "K" version of the Mult-Au-Matic method, one of the leading contributors to our modern American production system. Write for complete information. THE BULLARD COMPANY, Bridgeport 2, Connecticut.

BULLARD

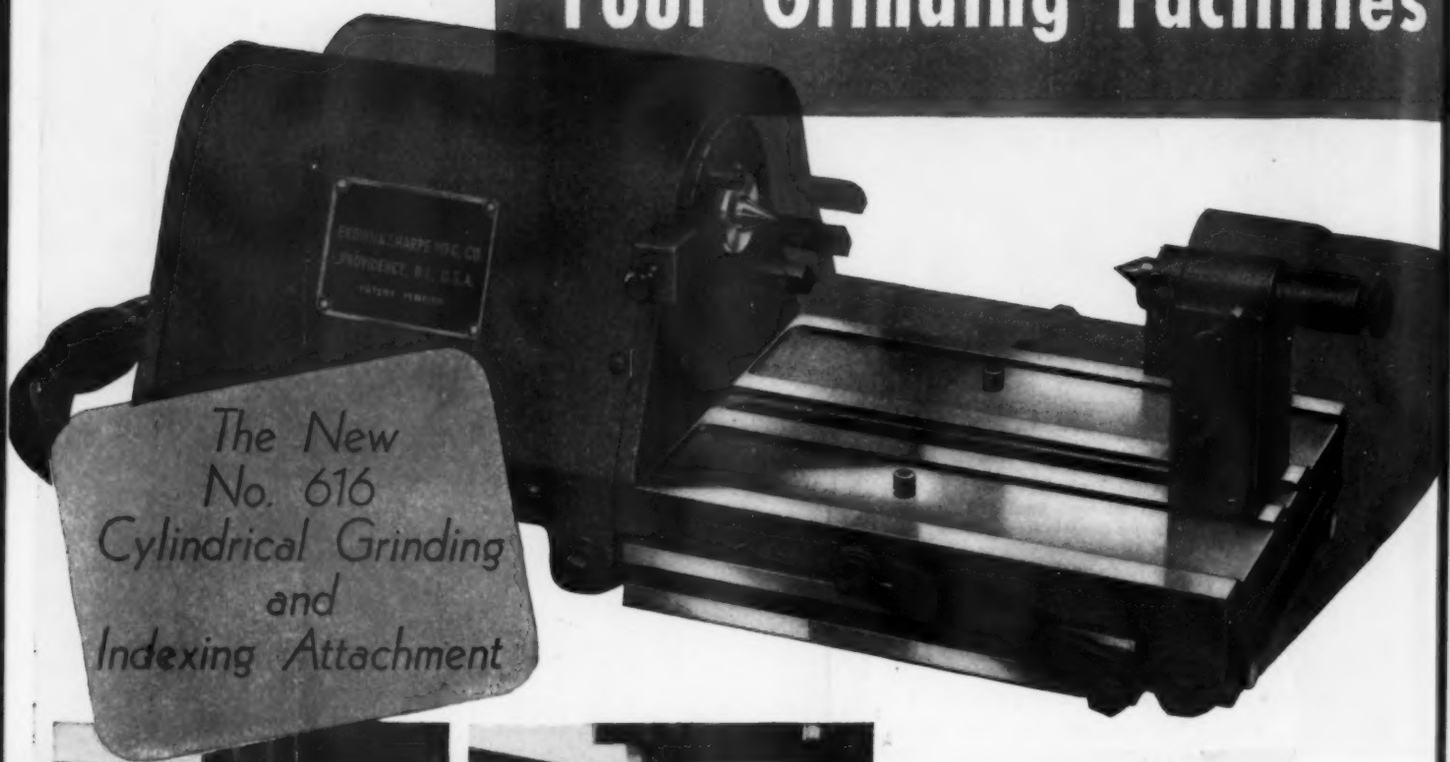
...D CREATES

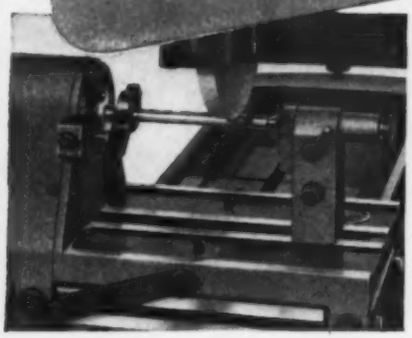


BULLARD Type "K" Mult-Au-Matics for work up to 10" in diameter come in four models: 6 or 12 spindles with speeds from 100 to 900 rpm, and 8 or 16 spindles with speeds from 98 to 880 rpm. 41 speed changes, 82 rates of feed, selective feeds and common speeds at all stations.

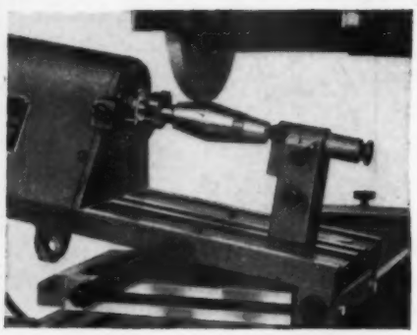
NEW METHODS TO MAKE MACHINES DO MORE

HERE'S A SIMPLE WAY to enlarge Your Grinding Facilities

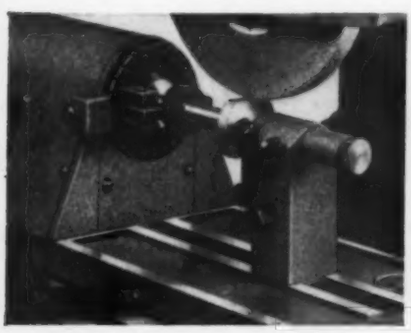




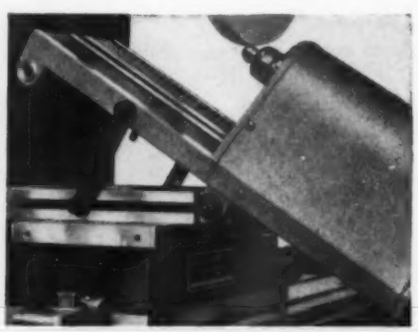
● Grinding work held between centers. Tailstock center is withdrawn for work change by simple swing of lever.



● Grinding taper shank. Attachment is readily adjustable to the desired taper.



● Grinding parallel flats using index plate. Index plate has 24 slots — is locked or released by plunger.



● Angular grinding of work held in spring collet. Attachment is held on permanent magnet chuck.

. . . for Surface Grinders

This new Brown & Sharpe Cylindrical Grinding and Indexing Attachment is designed to be used on surface grinders for dry grinding small cylindrical work, tapers and work requiring indexing. It is a simple way to enlarge your grinding facilities and may make unnecessary an investment in extra equipment.

Straight cylindrical or tapered work is ground between centers or, if ½" diameter or less, can be held in indexing spring chuck. Indexing is performed with headstock index plate or with interchangeable indexing spring chuck.

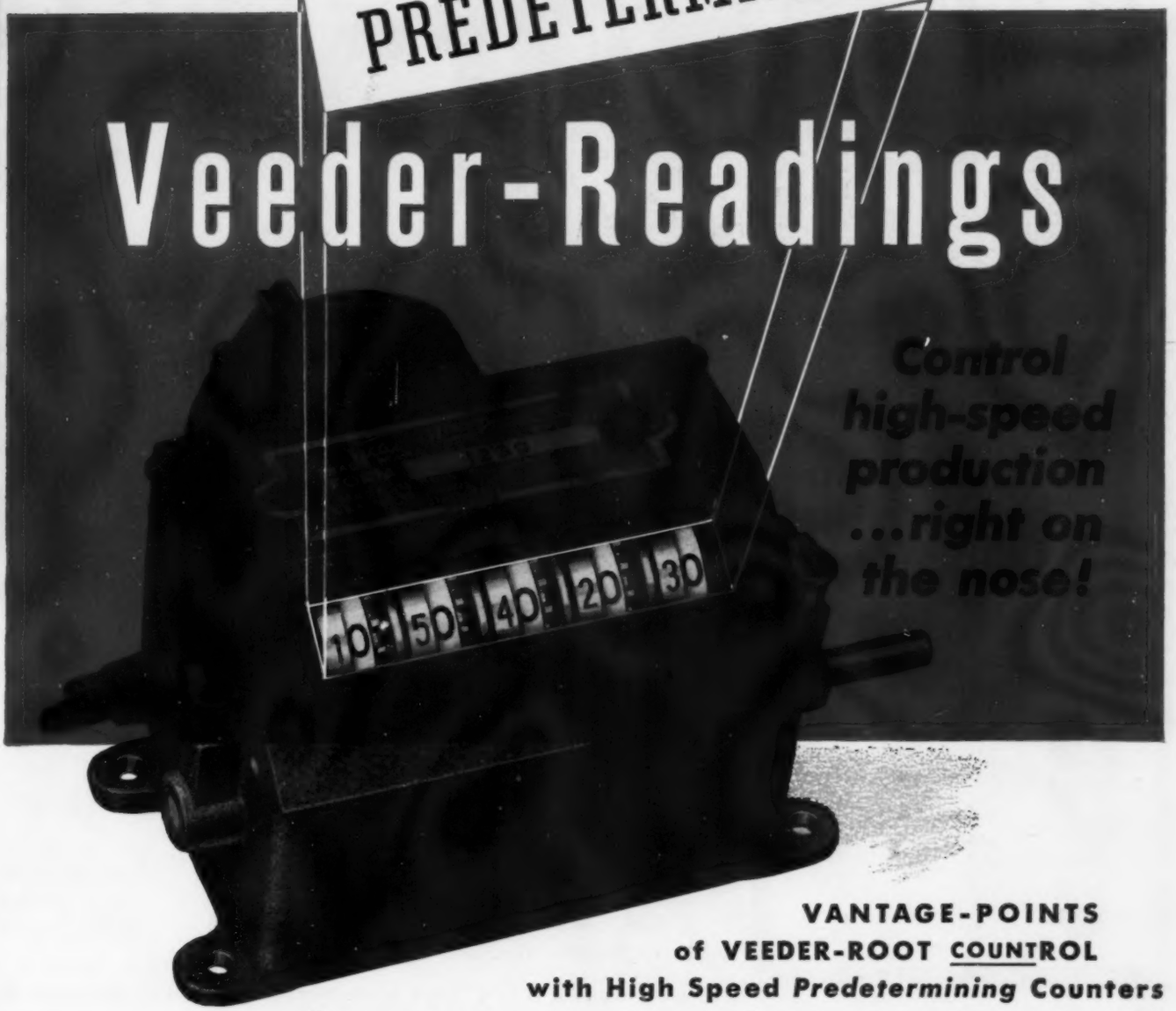
Centers swing 6" diameter; take work 5¼" in length. Maximum grinding angle, 45°. 1/60 H.P., 115V., A.C. motor is completely enclosed. Write for illustrated folder. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

We urge buying through the Distributor

BROWN & SHARPE

PREDETERMINED

Veeder-Readings



VANTAGE-POINTS of VEEDER-ROOT COUNTROL with High Speed *Predetermining* Counters

- Counter is easily pre-set to the proper number of strokes, turns, pieces, or other production units required. Just set the small, bright-metal wheels by hand.
- When run is completed and the counting wheels *read the same* as the pre-set wheels, counter signals the machine-operator or actuates a mechanism to stop the machine.
- No waste in surplus. And no cost-loss in setting job up again to make up for short run.
- Counter is easy to install and connect.

This High Speed Predetermining Counter is one of innumerable types of Veeder-Root Devices which "Count Everything on Earth." You can count on us to help *you* with any counting problem. Write.

Veeder-Root

INCORPORATED

HARTFORD 2, CONN.

In Canada: Veeder-Root of Canada, Ltd., 955 St. James St., Montreal 3. *In England:* Veeder-Root Ltd., Dickinson Works, 20 Purley Way, Croydon, Surrey.

Counting Devices

ATTACH THEM TO YOUR PRESENT MACHINES . . . BUILD THEM INTO YOUR NEW MACHINES

THE NEW Van Keuren

0 to 3" LIGHT WAVE MICROMETER

will improve your product . . .

Hardened, Ground, and Lapped ½" diameter Micrometer Screw. Reads to .00001" Carboloy tipped spindle and anvil.

The
LIGHT WAVE MICROMETER HEAD

A source of dependable Precision for modern machine tool and instrument applications.

•

Price, with calibration chart **$75.00**

The 208 page Van Keuren Catalog and Handbook No. 34 includes new epoch making formulas and 10 new tables which reduce the computations for the exact measurement of screws to a process of simple division. Your copy will be mailed promptly upon request.

•

THE Van Keuren Light Wave Micrometer is an instrument of exceptional merit, proven over a period of 15 years. It has enabled hundreds of High School boys and girls to produce and inspect parts to "Hundred Thousandths" of an inch.

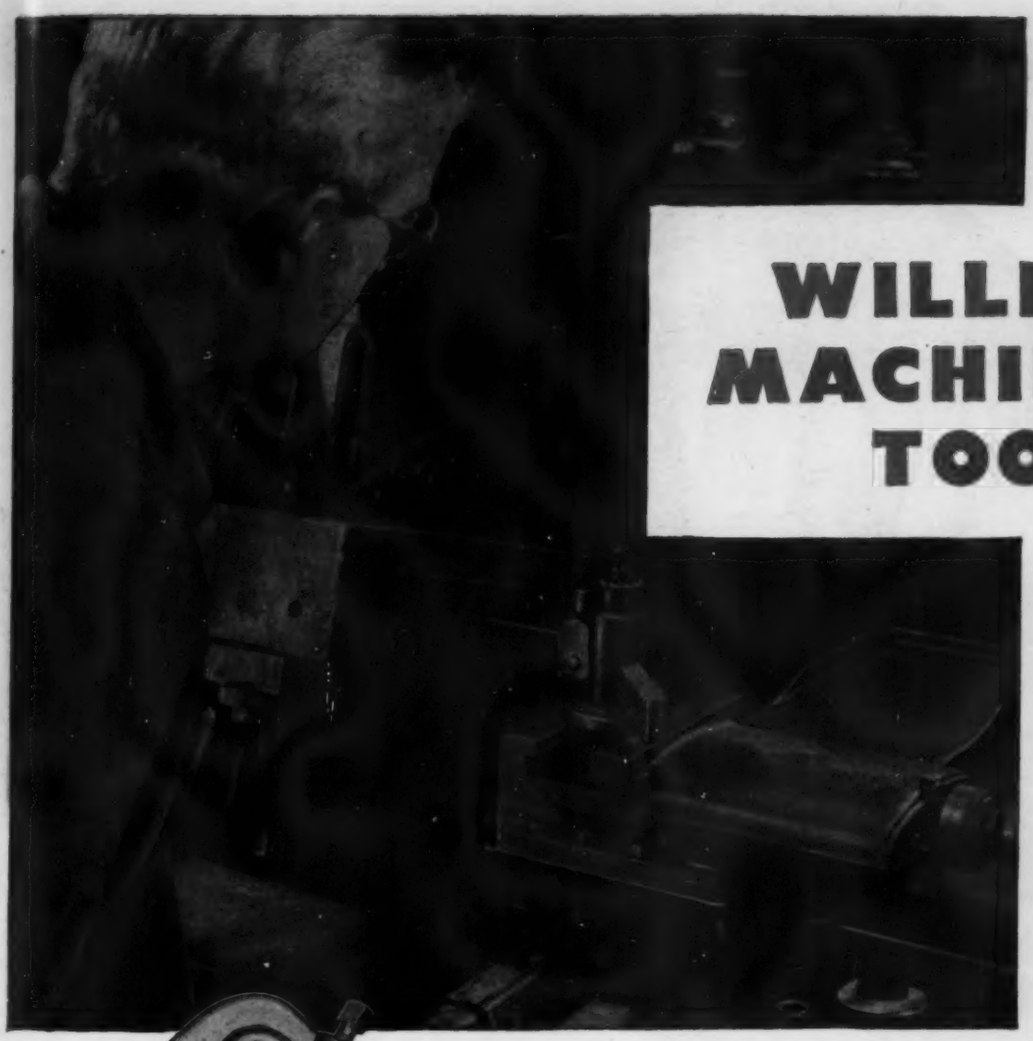
The New 0 to 3" Light Wave Micrometer has a ½" diameter, 40 threads per inch micrometer screw, which can be made with greater accuracy and which has 3 times the wearing surface of an ordinary micrometer screw. It has an 8" diameter micrometer wheel, with .0001" graduations 1/10" apart. It has a non parallax, vernier index which enables readings to be made to .00001". It has an index lock. It has carboloy tipped anvil and spindle. It is a sturdy, yet sensitive instrument which weighs 17 pounds. It is a portable measuring machine, built for "Sustained Accuracy".

The Light Wave Micrometer is not a comparator. No gage blocks are needed and no errors creep in from worn blocks. It is a direct source of dependable precision—fast, accurate and profitable.

THE Van Keuren CO., 176 WALTHAM STREET, WATERTOWN, MASS.

29th YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires



WILLIAMS MACHINISTS' TOOLS

Williams Light, Boring-Tool Holder. A handy and economical tool for light boring, internal threading and turning.

REDUCE SHOP & TOOLROOM COSTS

The fine design, convenience and dependable performance of Williams Drop-Forged Tools have earned them a preference by experienced machinists everywhere. They will help you produce *better* work at *lower* cost. Write for your copy of "Williams Machinists' Tools"... a 36-page booklet fully describing Williams' line of Tool Holders, Lathe Dogs and "C" and Strap Clamps.

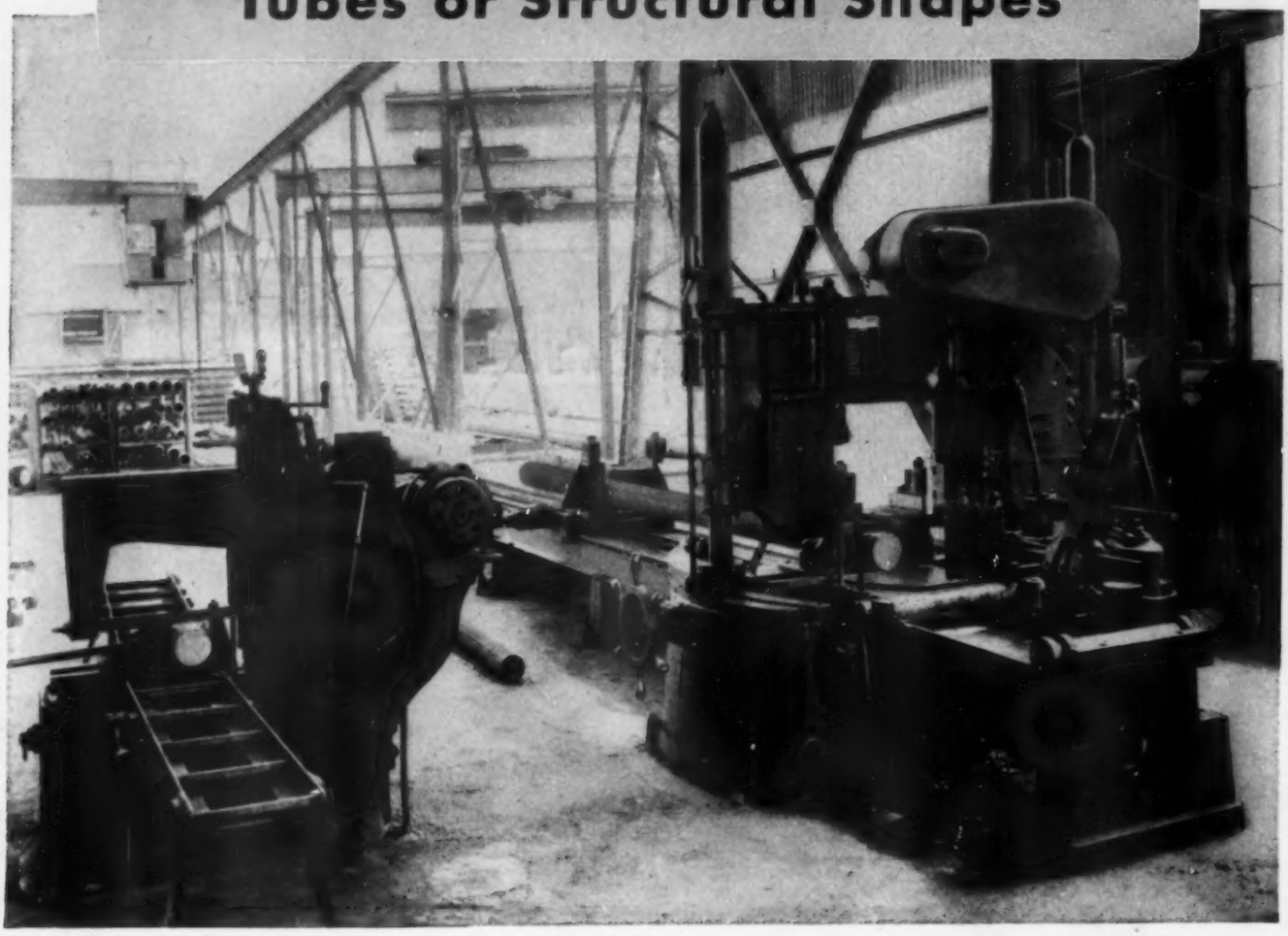
WILLIAMS

• OUR DISTRIBUTOR IS YOUR LOCAL WAREHOUSE

OPEN END, BOX, ADJUSTABLE & RATCHET WRENCHES; DETACHABLE SOCKETS & SETS; IMPACT SOCKETS; TOOL HOLDERS; LATHE DOGS; "C" CLAMPS; CHAIN PIPE TONGS & VISES; FLANGE JACKS, PLIERS, SCREWDRIVERS, PUNCHES & CHISSELS; SOFT FACED "NUPLAHEX" TIPPED HAMMERS; HOIST HOOKS; EYE BOLTS; ROD ENDS; CRANK & BALANCE HANDLES; TIMMIS SCREWS & NUTS

J. H. WILLIAMS & CO., BUFFALO 7, N. Y. *Distributors Everywhere*

Ideal for Oil Tools, Forging Bars, Tubes or Structural Shapes



The cutting-off department of Baash-Ross Company takes all sawing jobs as they come for they are equipped to quickly, easily and economically cut off steel of any size, type or shape. In the "oil tool" business you cut off about everything from drill rod to giant well drilling tools, from copper tubing to great 18-in. dia. heavy walled steel liner casings for wells. All can be quickly and accurately cut off with the saws illustrated—a No. 9A MARVEL High Speed Hack Saw (Capacity 10" x 10") and a No. 18 MARVEL Giant Hydraulic Hack Saw.

Ask to have the local MARVEL Sawing Engineer analyze your sawing problems, make recommendations and quote prices. Write for Catalog.

ARMSTRONG-BLUM MFG. COMPANY

"The Hack Saw People"

5700 BLOOMINGDALE AVENUE **CHICAGO 39, U. S. A.**

Metal Cutting MARVEL SAWS

Better Machines–Better Blades

Even *good* gaging can be done *better* with equipment like this

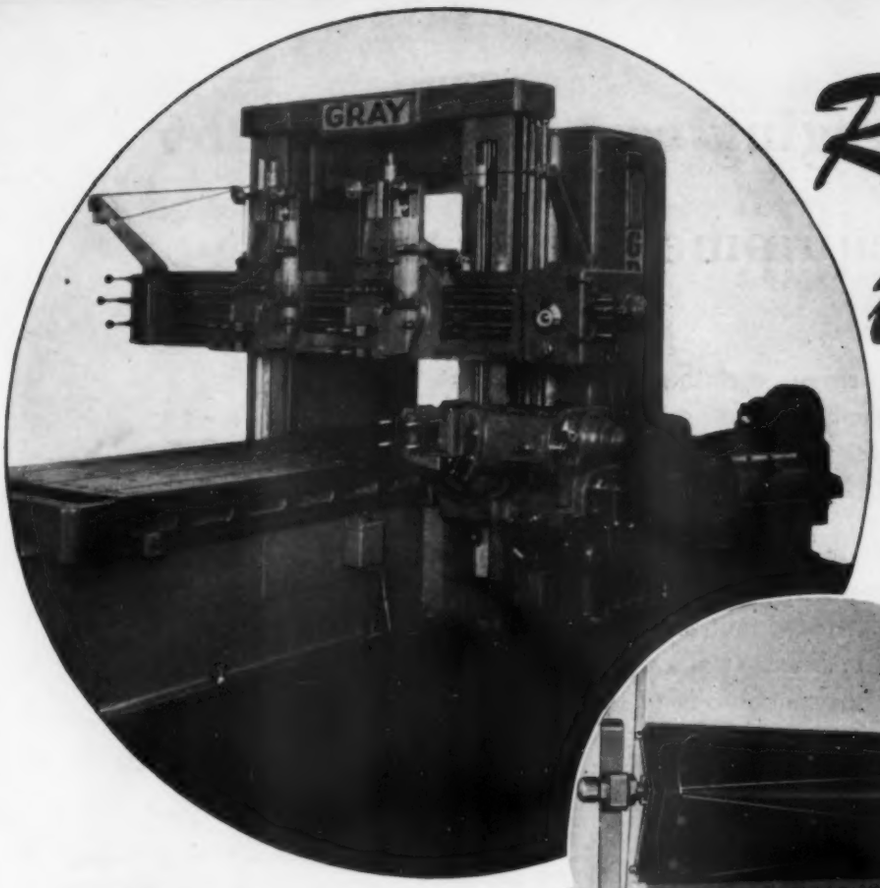
In almost any metalworking plant, there are certain gaging operations that will be improved when the present gages are retired. That goes even for the finest standard gages ever made — and by that we mean our own.

To take their place, Pratt & Whitney offers specially-built multiple gages like the one shown. This one is a happy combination of three P&W gaging methods — Electrolimit, Air-O-Limit, and Electrical Contact — that checks 14 dimensions of a piston. It quickly paid for itself because it eliminated many wasteful inspections; it takes one experienced inspector instead of fourteen.

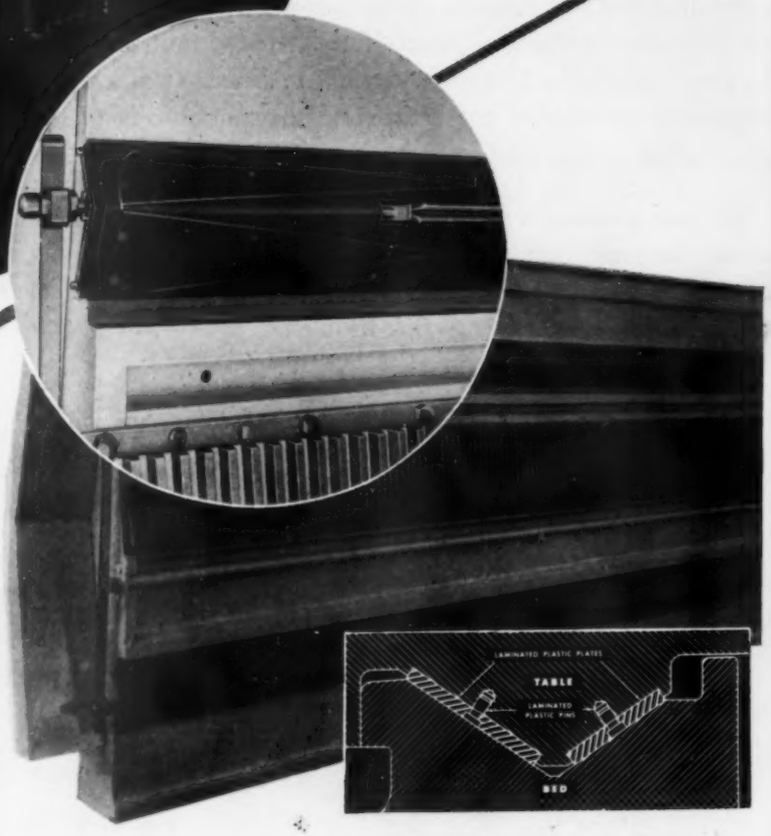
Do you produce a part with a number of precise dimensions around which we could build such a gage? If so, you can save money. P&W can provide the gage you need — special or standard. Feel free to call on us for counsel on any gaging problem.

PRATT & WHITNEY
Division Niles-Bement-Pond Co.
WEST HARTFORD 1, CONNECTICUT

Now at work in a leading automotive factory, this specially-built gage uses three P&W gaging methods for checking 14 piston dimensions to close limits. Diagrams on indicator panels show dimensions checked. At the touch of a button, piston is ink-marked with any of five grading symbols (indicating piston skirt diameter) for selective assembly. This is one of hundreds of P&W special gages.



Reap the Benefits



GRAY

NON-METALLIC WAYS*

insure freedom from scoring and make feasible increased speeds and table loads.

Remember—

"A Planer is no better than its Ways"

*Protected by Patent 2,378,343 and Patent Pending.

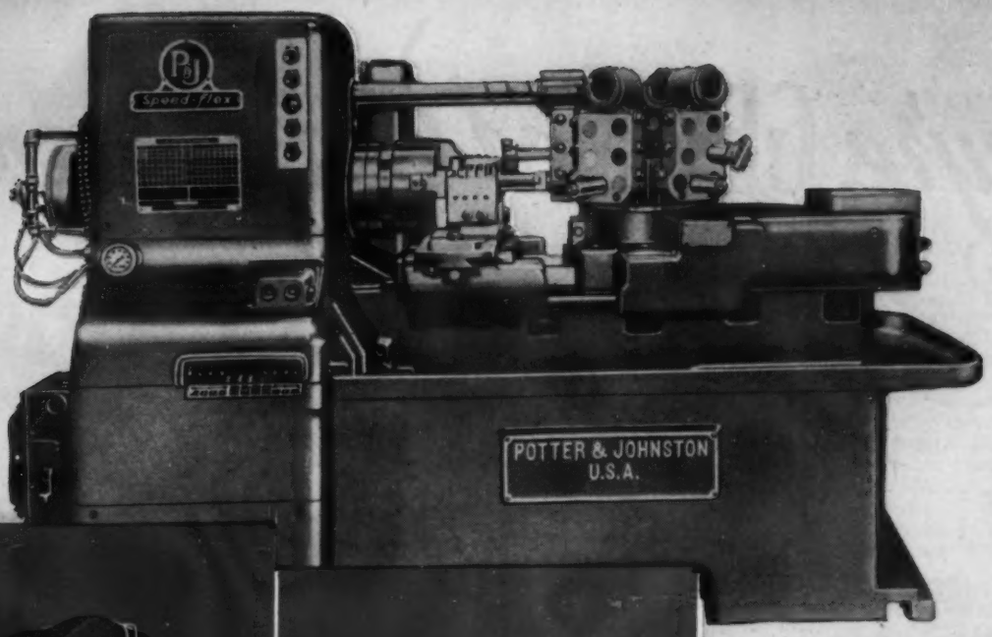
Scored Ways is the thief that robs your planer department of its accuracy. Drive him out of your plant by insisting on GRAY NON-METALLIC WAYS—the Way that will not score.

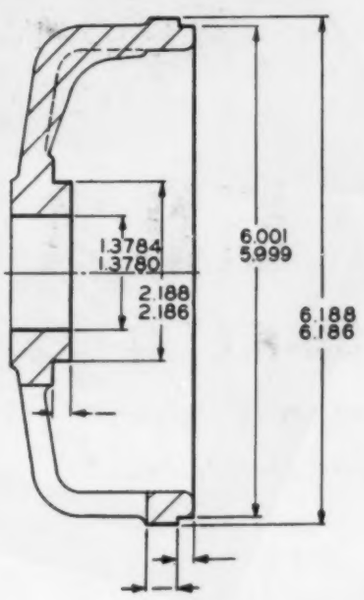
The G.A. GRAY *Company*

planers • milling planers
planer type milling machines
horizontal boring machines

CINCINNATI 7, OHIO, U. S. A.

Sold in Canada by Upton, Bradeen and James Ltd. • Sold in Latin America by Machine Affiliates.





Automatic operation—high spindle speeds and minimum non-cutting time contribute to fast production...on the

NEW P&J 3U SPEED-FLEX

This new Automatic Turret Lathe was developed by P&J engineers to provide a machine which would assure high output of small parts at low cost per piece. The job shown here—a cast iron end shield—is a typical example of how these objectives are attained on the 3U SPEED-FLEX.

FLOOR-TO-FLOOR TIME—2.06 MINUTES
PIECES PER HOUR—29

Split-second changes in feed and speeds under electro-pneumatic control and close accurate setting of dogs attached to control drums reduce the non-cutting portion of the machine cycle to a minimum. Ample power and rigidity are provided to take full advantage of carbide cutting tools.

A study of how this job is handled may suggest how you, too, can step up the production of your small parts. In any event, consult P&J engineers on your problem and ask them to submit suggestions for handling your duplicate parts on a P&J machine.

DETAILS OF JOB

Part: End Shield

Material: Cast Iron

Method and Operation: Presenting closed end to spindle grip on 1⅜" radius with 3 jaws; position against jaws at rim.

Machine as follows:

1st T.F.: Bore holes; turn and face 6.000"-6.187" dia.; turn and face 2.187" dia.; face 2¾" dia. shoulder.

2nd T.F.: Finish the above.

3rd T.F.: Blank.

4th T.F.: Size turn 6.000"-6.187" dia.; turn 2.187" dia.

5th T.F.: Blank.

6th T.F.: Blank.

Allow for diamond boring in hole.

POTTER & JOHNSTON MACHINE CO.

Pioneer Manufacturer of Automatic Turret Lathes

PAWTUCKET, RHODE ISLAND

They're GEMS of Craftsmanship

Hollow Set Screw
Knurled Point Hollow Set Screw*
Hollow Set Screw Knurled Threads*
Knurled Head Cap Screw
Square Head Set Screw
Knurled Head Stripper Bolt*

... they're UNBRAKO

REG. U.S. PAT. OFF

Yes, "Unbrako" Screw Products are "gems in their own right." Of superior quality alloy steel, they are turned into "Unbrako" Socket Screws of ultra precision and finish, resembling the skilled craftsmanship so necessary for finely-cut precious stones. "Unbrako" Products are *tested* to *assure* the service that has made them popular for many years . . . a popularity resting securely on the modern production methods in our plant.

A "big point" of which we are justly proud, is our exclusive KNURLING feature, which is incorporated either on threads or points of "Unbrako" set screws, transforming them into excellent "Self-Lockers." *Knurling* also provides a slip and fumble-proof grip on stripper bolt and cap screw heads. Of course, the Internal Wrenching feature of "Unbrako" Socket Screw Products results in weight-saving and compact designs. Sizes available from No. 4 to 1 ½" in diameter, in a full range of lengths. Ask for your copy of the "Unbrako" Catalog . . . informative and useful.

"Unbrako" Products are sold entirely through Industrial Distributors.

Knurling of Socket Screws originated with "Unbrako" in 1934.

*PAT'D., PAT'S. PEND., OR PAT'S. APPLIED FOR

OVER 45 YEARS IN BUSINESS

STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA., BOX [illegible] · BRANCHES: BOSTON · CHICAGO · DETROIT · INDIANAPOLIS · ST. LOUIS · SAN FRANCISCO

Four more to choose from

The New Jones & Lamson BC-14 Bench Optical Comparator, with 14" diameter screen, offers you a choice of four different table assembly combinations. This enables you to choose the model best suited to your needs, and obtain... *AT LOWEST COST... THE FINEST IN OPTICAL COMPARATORS.*

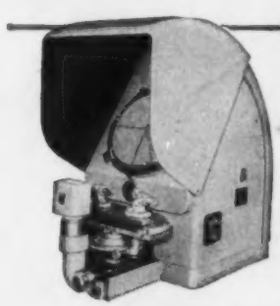
These models provide a larger lens field and a larger screen area than the smaller bench models. They are designed to cover an almost unlimited range of inspection work—they provide a means of inspection that is accurate, rapid and economical. Costly gages can be dispensed with, costly time saved and quality improved.

Many components and products formerly inspected by slow, tedious methods that retarded production and drained profits, are now inspected in a matter of seconds or minutes on Jones & Lamson Comparators, with consequent savings all along the line.

Our engineers are inspection specialists; their knowledge of holding fixtures, handling methods and suitable Comparator equipment, qualify them to study your inspection problems and make recommendations that will improve your profit picture. They have for others. Call, write or wire for their service today.

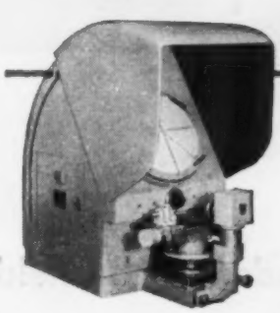
1 Model BC-14A

This model has a platform type table 5 x 10" for inspecting, by comparison, a large variety of objects on a production basis. The top of the table is 5" below the center of the lens system to provide ample space for various work holding fixtures. Magnifications range from 10 to 100.



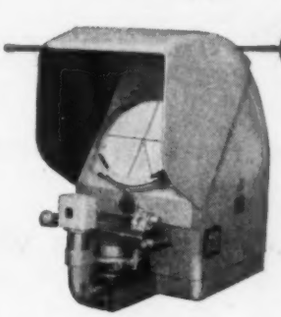
2 Model BC-14B

This model has a 16" table that can be compounded for inspecting objects with helices. The table can be elevated vertically 1¾". It is used for inspection, by comparison, of screw threads or other irregular profiles. Objects up to 3" diameter and 11" long between centers can be inspected at magnifications ranging from 10 to 100.



3 Model BC-14C

This model has a 16" table with 2" lateral travel that can be compounded for inspecting objects with helices. The table can be elevated vertically 1¾". Objects up to 3" diameter and 11" long between centers can be inspected at magnifications ranging from 10 to 100.



4 Model BC-14D

This model is used for the complete measurement of tools, gages and products. The 16" table with 2" lateral travel can be compounded for inspecting objects with helices. It can be elevated vertically 1¾". The chart ring is graduated in degrees and minutes and the handwheel is graduated in .0001". Objects up to 3" diameter and 11" long between centers can be inspected at magnifications ranging from 10 to 100.

Jones & Lamson
OPTICAL COMPARATORS

JONES & LAMSON MACHINE COMPANY
Springfield, Vermont, U. S. A.

Manufacturer of: Universal Turret Lathes · Fay Automatic Lathes · Automatic Double-End Milling and Centering Machines · Automatic Thread Grinders · Optical Comparators · Automatic Opening Threading Dies and Chasers · Ground Thread Flat Rolling Dies

The DeVlieg JIGMIL is now recognized as The World's Leader in the field of accurate boring, in addition to its unique capacity for high productivity on:

1. **Single part precision boring.**
2. **Tool, jig and die work.**
3. **Repetitive production work without jigs.**

Write today for new descriptive booklet.

DEVLIEG JIGMIL

DeVLIEG MACHINE COMPANY

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SPRINGFIELD

Geared Head LATHES

—are the result of more than 60 years of constant development based upon actual shop experience and are designed and built throughout to meet the exacting demands of modern manufacturing techniques.

No finer lathes exist today. Not only is there constant improvement in design and performance, but every detail of manufacture must conform to the highest precision standards. The gears of the Headstock are typical of these standards. Every gear is forged from the best grade of chrome—Molybdenum steel, heat-treated, and the teeth GROUND to close tolerances under the watchful guidance of experienced craftsmen to eliminate chatter, insure highest speeds and maximum performance.

THE SPRINGFIELD MACHINE TOOL COMPANY

SPRINGFIELD, OHIO, U. S. A.

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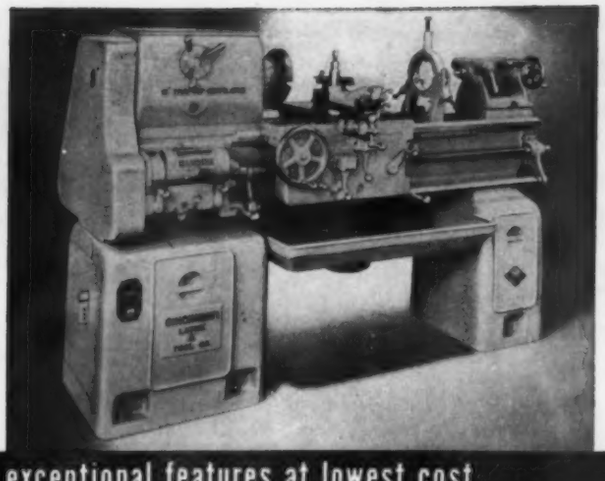
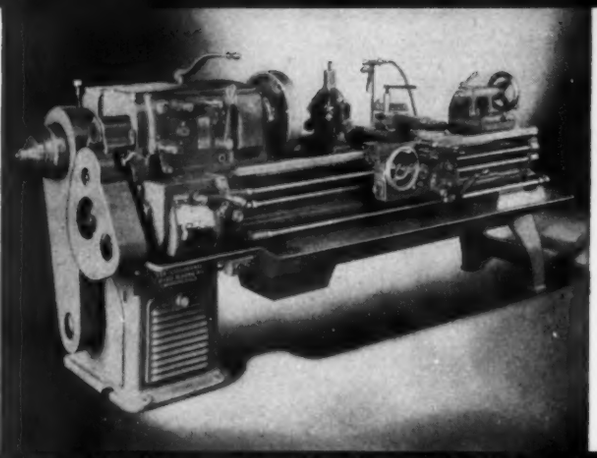
Exclusive Representatives in All Principal Cities



NEW TRAY TOP CINTILATHE, a light duty, low cost motor driven geared head engine lathe, offers features not usually included in lathes of their size and price range. Built in 10″, 12½″, 15″, and 18″ swing sizes, and distances between centers from 18″ to 60″, 12 spindle speeds, with an overall ratio of 41 to 1, 48 thread and feed changes . . . Standard Motor Drive 10″—1 HP., 12½″—1½ HP., 15″—2 HP., 18″—3 HP . . . Tray Top Cintilathes in 15″ and 18″ sizes available with gap, including gap block.

exceptional features at lowest cost

STANDARD CINTILATHES in six nominal swings 14″ to 24″, bed lengths providing distances between centers from 32″ to 238″, 12 spindle speeds—32 changes of threads and feeds. These medium duty low cost lathes handle a wide variety of turning, boring, and threading operations for long or short runs. They offer capacity for practically all of your lathe work with a minimum investment. All sizes may be furnished with gap, including gap block. A profit maker for general machine shops, small manufacturing plants, and maintenance and repair departments.



capacity for practically all your lathe work

NEW CONTOURMATIC CINTILATHE with feather-touch tracer control, turns multiple diameter shafts in small or medium production lots, automatically, accurately, and economically, and retains the full versatility of a standard engine lathe . . . Two machines in one. "Mike" once and all dimensions come true. Sensitive all hydraulic tracer control provides automatic duplication of master shape with high degree of accuracy. Supplied in same sizes as standard Cintilathes.

two machines in one, with feather-touch tracer control

NEW TRACERMATIC CINTILATHE is a special machine for use primarily on molds for bottles, tableware and other items in glass industry, embossing dies, dies for plastics, etc., where extreme accuracy, fineness of detail, and speed of production are required. The work need not be circular in cross section. Ovals, squares, rectangles, etc., with rounded corners and intricate patterns are readily produced.

WRITE FOR LATEST CATALOGS AND PRICES

CINCINNATI LATHE & TOOL CO.

OAKLEY, CINCINNATI 9, OHIO • CABLE ADDRESS: CINTILATHE

The CONE AUTOMATIC MACHINE COMPANY sees many

GOOD THINGS AHEAD

It is reported that . . . . . .

The National Bureau of Standards has developed a simple, non-electrical method of plating nickel and cobalt by means of a catalytic reaction.

get ready with CONE for tomorrow

Five Star Mfg. Co. of East Grand Forks, Minn., makes a head bolt for an automobile that is an electric heater and keeps the engine warm all night.

be ready with CONE for today

Minnesota Mining and Mfg. Co. has applied its "Scotch Tape" adhesive to rubber electrical tape.

get ready with CONE for tomorrow

Plymouth Cordage Co. is making rope from Saran that is resistant to most alkalis, acids and solvents.

be ready with CONE for today

Synthetic rubies and sapphires are being made by Linde Air Products Co. and sold for about one third the price of natural stones.

get ready with CONE for tomorrow

A new milling machine made by Ingersoll Milling Machine Co. is equipped with a carbide cutter 92 inches in diameter and driven by an 800 horsepower motor.

be ready with CONE for today

Goodyear has announced a new truck tire with a twelve ply Nylon carcass claimed to be 50% stronger than rayon.

get ready with CONE for tomorrow

The new General Electric refrigerator will have 8 cubic feet of space in the same size case as the former 6-foot model. Refrigerant evaporates in channels in the walls.

Copperweld Steel Co. is making an automotive brake drum with copper fins for heat radiation.

be ready with CONE for today

Mirrors protected by a film of evaporated silicon by National Research Corp. of Cambridge, Mass., are claimed to be 1600 times more resistant to abrasion.

get ready with CONE for tomorrow

The possibility of transmitting electric power at 500,000 volts overland lines will be tested by American Gas and Electric Co.

be ready with CONE for today

Willis-Overland expects to have its "Jeepster" sport phaeton on the market in the spring.

An overall quality rating of assembled ball bearings is provided by the Physicists Research Co. Anderometer. This shop instrument also permits numerical specification of bearing quality.

get ready with CONE for tomorrow

The problem of removing large quantities of chips from machine tools has been solved at Plymouth Motor Division by the use of conveyors.

be ready with CONE for today

The new fork lift truck made by Automatic Transportation Company can pick up a 45,000 pound box car. It drives on four wheels.

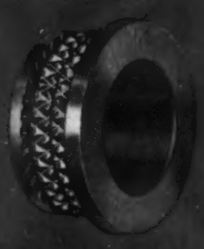
get ready with CONE for tomorrow

Owens-Corning Fiberglas Corp. has developed an asphalt treated kraft paper reinforced with glass fibers for extra tear, tensile and puncture strength.

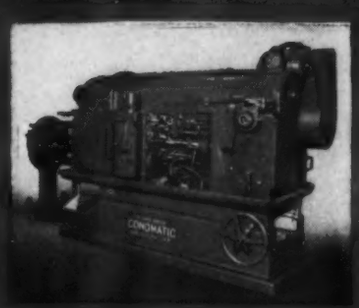
FOLLOW THESE PAGES FOR NEWS OF PROGRESSIVE PRODUCTION

Progressively Conomatic!

This piece was produced from 2 1/8" dia. S.A.E. 1112 by 18 tools in 12 seconds on a 2 5/8" Eight-Spindle Conomatic.



Any good multiple spindle automatic should handle the ordinary run of work. But the *tough* jobs are profitable on Cones.



Ask your CONE representative to show you our new color motion picture

CONE

AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U.S.A.

48

FRACTIONAL HORSEPOWER GEARING

G. S. production and inspection techniques have been developed to an unusually high degree of perfection. Every conceivable device is employed to assure *UNIFORMITY!* Gear after gear, in large numbers, is produced with surprising speed and efficiency. Only a quarter century of *specialization* in making Fractional Horsepower Gears exclusively could achieve such *uniform* accuracy in the manufacture of small gears in production quantities.

If you wish to assure smoother, quieter, more dependable performance in the product you make, by all means specify "G. S." Small Gears! Let our skilled engineers study your requirements and give you suggestions, and moderate price estimates. There is no obligation.

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GEAR Specialties

Spurs • Spirals • Helicals • Bevels • Internals • Worm Gearing • Racks • Thread Grinding

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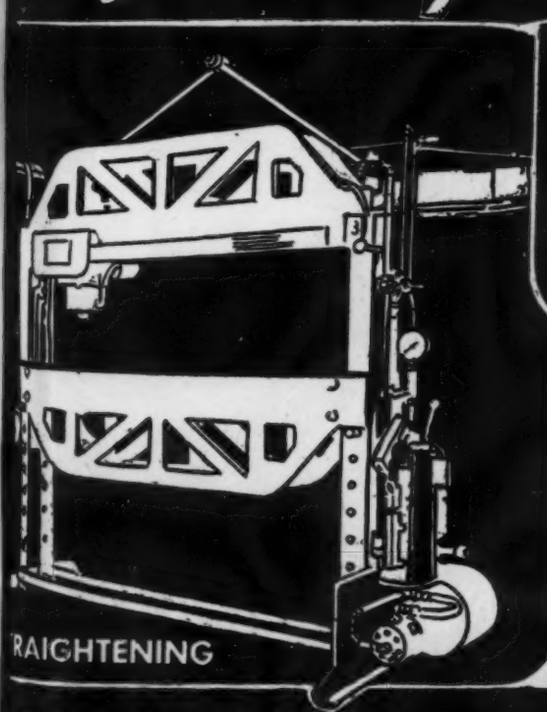
MEMBER OF AGMA

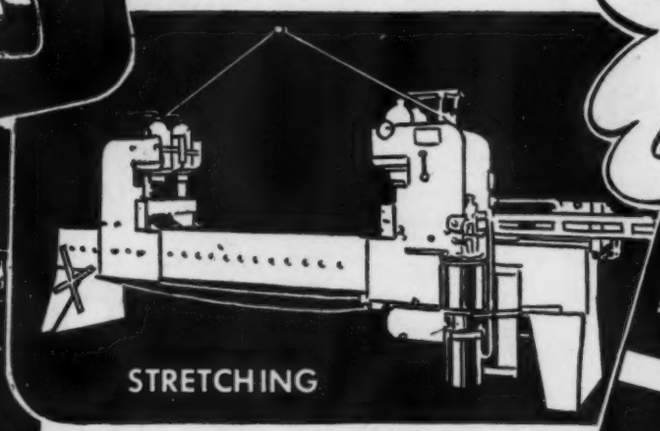
WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF FRACTIONAL HORSEPOWER GEARS

Name the JOB!

There's a KRW PRESS that can do it BETTER... for LESS

● **Illustrated here are four KRW Hydraulic Press adaptations that are typical of many being built by KRW today. All are priced from 30 to 200% less than competitive makes of comparable tonnages or capacities. All are motor-driven and incorporate the time and production proven features that have made the standard KRW Hydraulic Arbor Presses...** ***the most widely used press of their type in America.*** **Take the KRW Sliding Head Straightening Press as an example. This type KRW Press has been effecting tremendous labor savings in fabricating plants where plate must be "trued up" before it is processed or fabricated. The heavy, hand method formerly used was archaic and very costly by comparison. The same story holds true of KRW Stretcher-Levellers, KRW Blanking and Forming Presses, KRW Compression Molding Presses, KRW Bending Presses and many others. To save your time and ours, tell us your problem in terms of what you want to accomplish. We'll give you an answer and furnish literature that is pertinent to your needs. Mail the coupon now.**





Write for the **NEW KRW** *Catalog.....*

K·R·WILSON

215 MAIN ST. · BUFFALO 3, N. Y.

K. R. Wilson, 215 Main Street, Buffalo 3, N. Y. 11

Please send your catalog. We are particularly interested in your

Bending Presses ☐ Compression Molding Press ☐

Straightening Press ☐ Stretcher-Leveller ☐ Forming and Blanking Press ☐

Firm Name .....

Address .....

City and Zone ..... **State** .....

Another HYPRO Exclusive Feature—

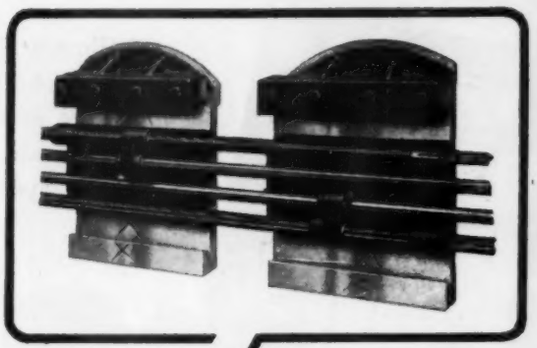
Back Lash Elimination through Double Nut Construction on Cross Feed and Down Feed Screws

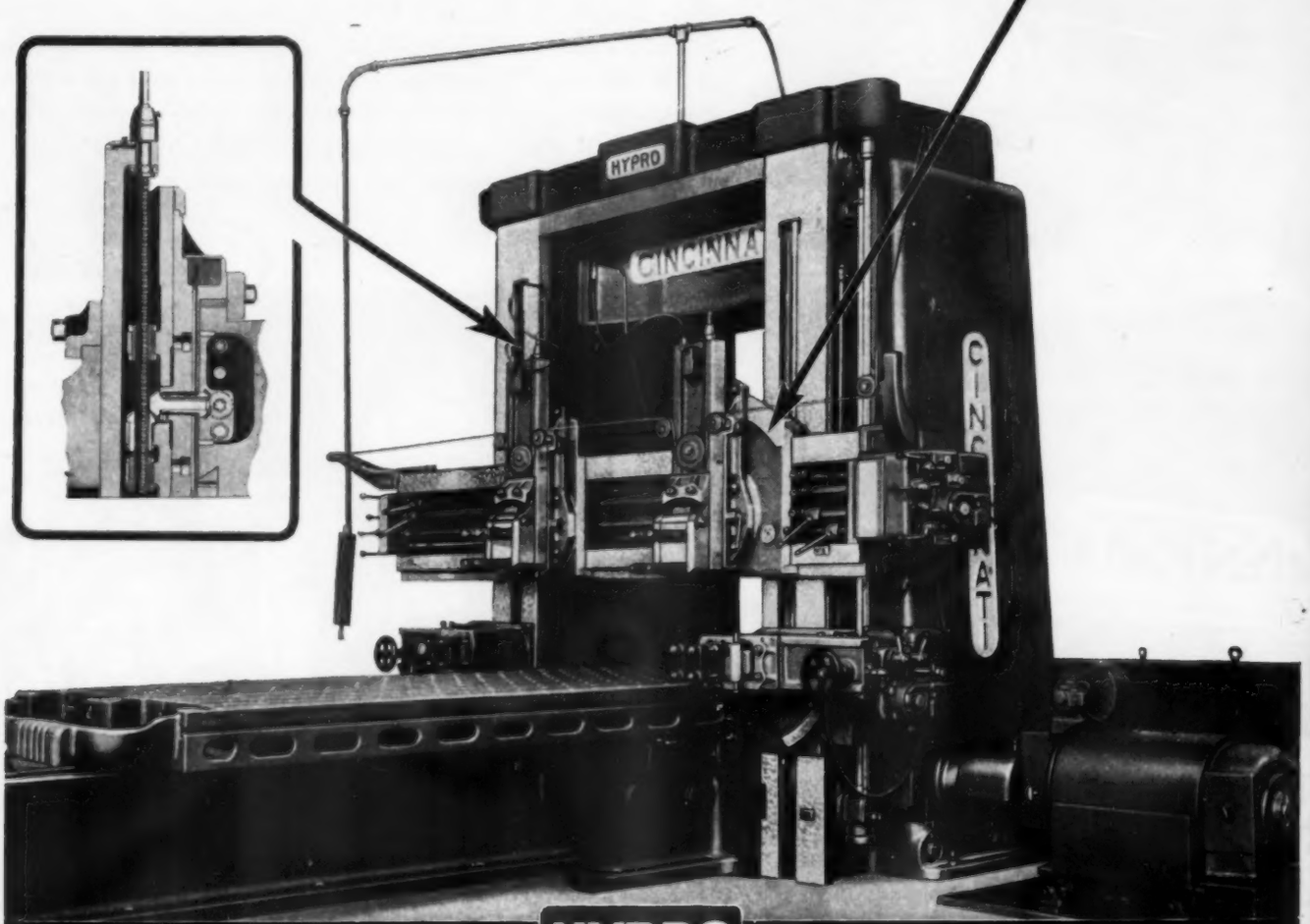
Double nuts made of a special bearing bronze are used on both saddle and down slide screws.

These nuts are held in the saddle and slide nut bearings by retaining nuts so that it is possible to keep the saddle and down slide free of backlash by adjustment of one retaining nut.

This retaining nut is accessible from the edge of the saddle and from the bottom of the rail head slide so that backlash elimination is possible without removal of any part of the head.

Each bronze nut is full length of any conventional single nut construction, thereby dividing the wear.

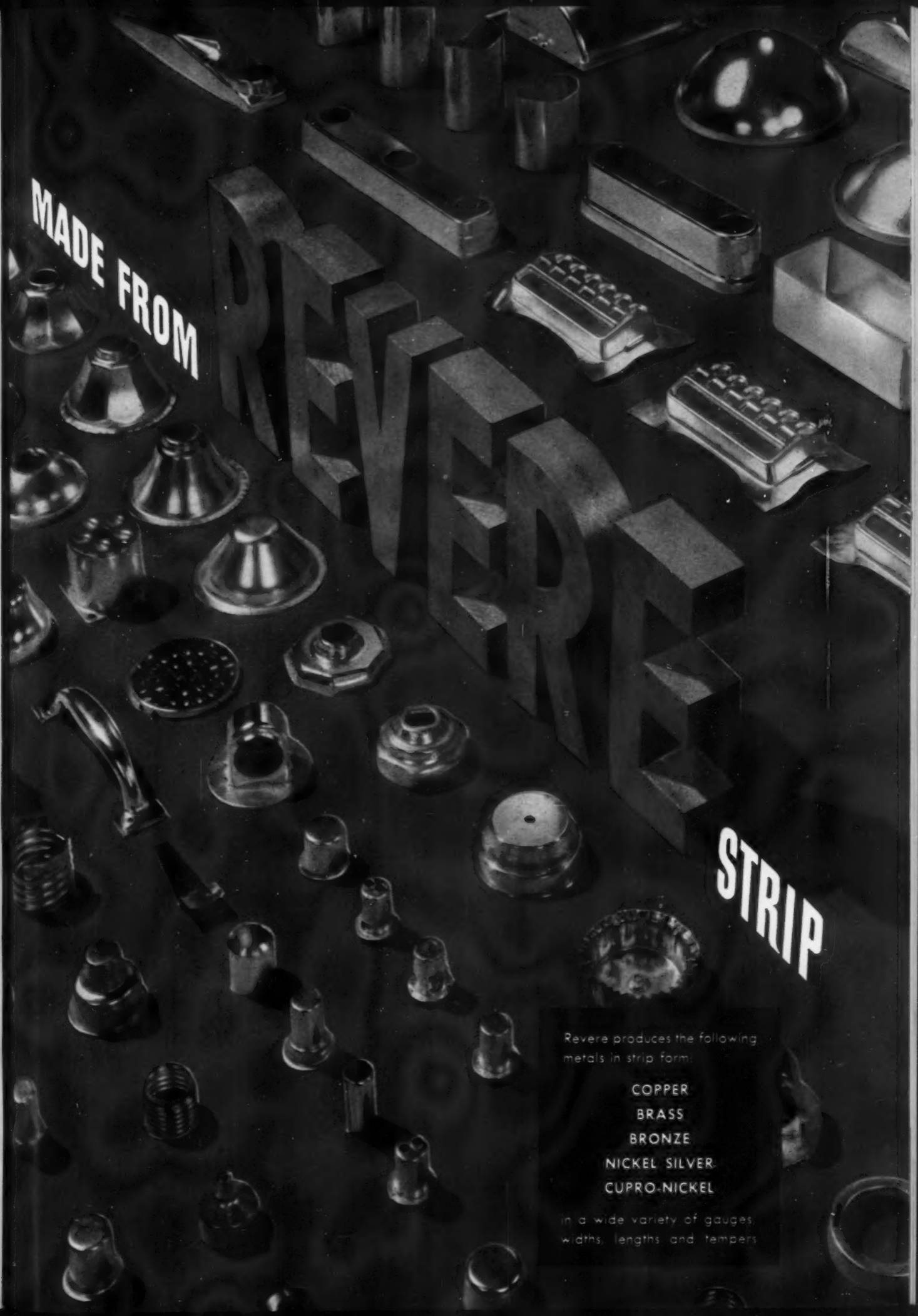




THE CINCINNATI HYPRO PLANER COMPANY

PLANERS · BORING MILLS · PLANER TYPE MILLERS

CINCINNATI, OHIO


MADE FROM
REVERE
STRIP
Revere produces the following metals in strip form
COPPER
BRASS
BRONZE
NICKEL SILVER
CUPRO-NICKEL
in a wide variety of gauges, widths, lengths and tempers

REVERE STRIP and ROLLS for fast, economical fabrication

REVERE Metals in strip and roll form are widely used throughout industry for the manufacture of parts and products by such processes as deep drawing, stamping, punching, spinning, embossing, rolling, etching, soldering, polishing, plating.

Special finishes, such as embossed, polished, etc., are available from the mill for some alloys and forms. Naturally, the value of such finishes depends upon two main factors: the fabrication processes through which the metal is put in your plant, and the nature of the articles or parts you make. Where suitable, special finishes often reduce costs and improve the beauty, attractiveness or service of the finished product.

BRASS

Brass is an old and honored metal, corrosion-resistant, and adaptable to a wide range of fabrication conditions, from simple stamping to exceptionally deep drawing, as in cartridge cases. Yet it should be remembered that brass is not just brass. There are many different brasses which vary in their composition. In addition, each brass alloy can be had in a variety of physical conditions. By rigid control of processing in the Revere Mills, strict specifications as to temper, hardness, and grain size are met.

COPPER

Revere produces several types of copper for various applications. All contain over 99% pure copper, but some contain in addition traces of other elements which adjust the physical qualities to meet special needs. Electrolytic Tough Pitch Copper in strip form is widely used for the manufacture of electrical parts by stamping and drawing.

GENERAL CONSIDERATIONS

The importance of a careful study of both composition and physical properties cannot be stressed too often. It might be, for example, that a difference in alloy, temper, gauge or dimensions would make manufacturing economies possible.

Sometimes a reduction in the cost of the material can be achieved by slight changes in specifications, without affecting fabrication or service of the part. To this saving may be added an additional one—reduction in amount of scrap. Though scrap has a high re-sale value, reduction in the amount of it should result in lower unit costs.

CARTRIDGE BRASS, 70%

(Seventy-Thirty Brass). Alloy No. 160. (Copper 70.0%, zinc 30.0%).

Forms Available: Sheet, strip, tube, rod, rectangular bar and lockseam tubing.

General Properties: Revere Seventy-Thirty Brass has the best combination of ductility and strength of all the brasses and accordingly has superior cold-working properties.

Typical Uses: Seventy-Thirty Brass is recommended for difficult deep drawn, stamped or spun parts, cartridge cases, ammunition components.

Working Properties: Cold-working, soldering, polishing—excellent. Hot-working—good. Machining—fair. Welding—gas, carbon arc, metal arc, spot and seam welding for thin gauge.

ASTM Specifications: Sheet: B19, B36. Tube: B135. Rod: B134.

ELECTROLYTIC TOUGH-PITCH COPPER

Alloy No. 100. (Copper 99.90%, minimum).

Forms Available: Sheet, strip, plate, rod, bus bar, tube, forgings.

General Properties: This copper combines high electrical and thermal conductivity with excellent working qualities. It resists corrosion, and is a favorite for parts that are to be plated.

Typical Uses: Electrolytic Copper is recommended for stamped and drawn parts such as escutcheons, lamp sockets, housings; for electrical equipment and conductors; for roofing, flashing, gutters; process equipment; printing rolls; forgings.

Working Properties: Cold-working, hot-working, soldering, polishing, plating—excellent. Machining—fair. Welding—deoxidized copper preferred.

ASTM Specifications: Sheet: B11, B101, B152. Rod: B12, B48, B49, B124, B133, B187. Tube: B13, B111, B188.

PHOSPHOR BRONZE, 5% (A)

Alloy No. 308. (Copper 95.0%, tin 5.0).

Forms Available: Sheet, strip, rod.

General Properties: Revere Phosphor Bronze, grade A, possesses high tensile strength, high resistance to corrosion and fatigue and has a low friction coefficient. It is also highly resistant to season cracking.

Typical Uses: Revere Phosphor Bronze, grade A, is used for springs, diaphragms, bellows, lock washers, cotter pins, fuse clips, clutch discs, screw machine stock, perforated sheets, etc.

Working Properties: Cold-working, soldering, polishing—excellent. Hot-working—poor. Machining—fair. Welding—gas, carbon arc, metal arc, spot and seam welding for thin gauge.

ASTM Specifications: Sheet: B100, B103. Rod: B139, B159.

HERCULOY (Silicon Bronze)

Alloy	Copper	Silicon	Manganese
420	96.0%	3.0%	1.0%
421	98.00%	1.75%	0.25%

Forms Available: Sheet, strip, plate, rod, wire, tube, forgings.

General Properties: Herculoy has excellent mechanical properties. The strength of Herculoy is comparable to that of low and medium carbon steel. Its resistance to corrosion is similar to that of copper. It is non-magnetic and gold colored.

Typical Uses: Herculoy is recommended for welded tanks, pressure vessels (unfired pressure vessels codes), vats, baskets, chemical equipment, etc.; Herculoy 421 for hardware, bolts, screws, lag screws, cotter pins, washers, turnbuckles, marine construction, screens, filters, ducts, weatherstrips, springs, forgings.

Working Properties: Cold-working, soldering—excellent. Hot-working—good. Machining, polishing—fair. Welding—gas, carbon arc, metal arc, spot and seam welding for narrow gauge.

ASTM Specifications: Sheet: B96, B97, B100. Rod: B98, B99, B124.

The following Revere Metals are also produced in strip and roll: Copper: Silver-bearing, Deoxidized, Oxygen-free — Nickel Silver — Admiralty — Commercial Bronze, 90% — Red Brass, 85% — Yellow Brass — Naval Brass — Cupro-Nickel.

On this page you will find technical data on only a few of the Revere Metals produced in strip and other forms as well. If you require further information, get in touch with any Revere Office or distributor.

REVERE

COPPER AND BRASS INCORPORATED

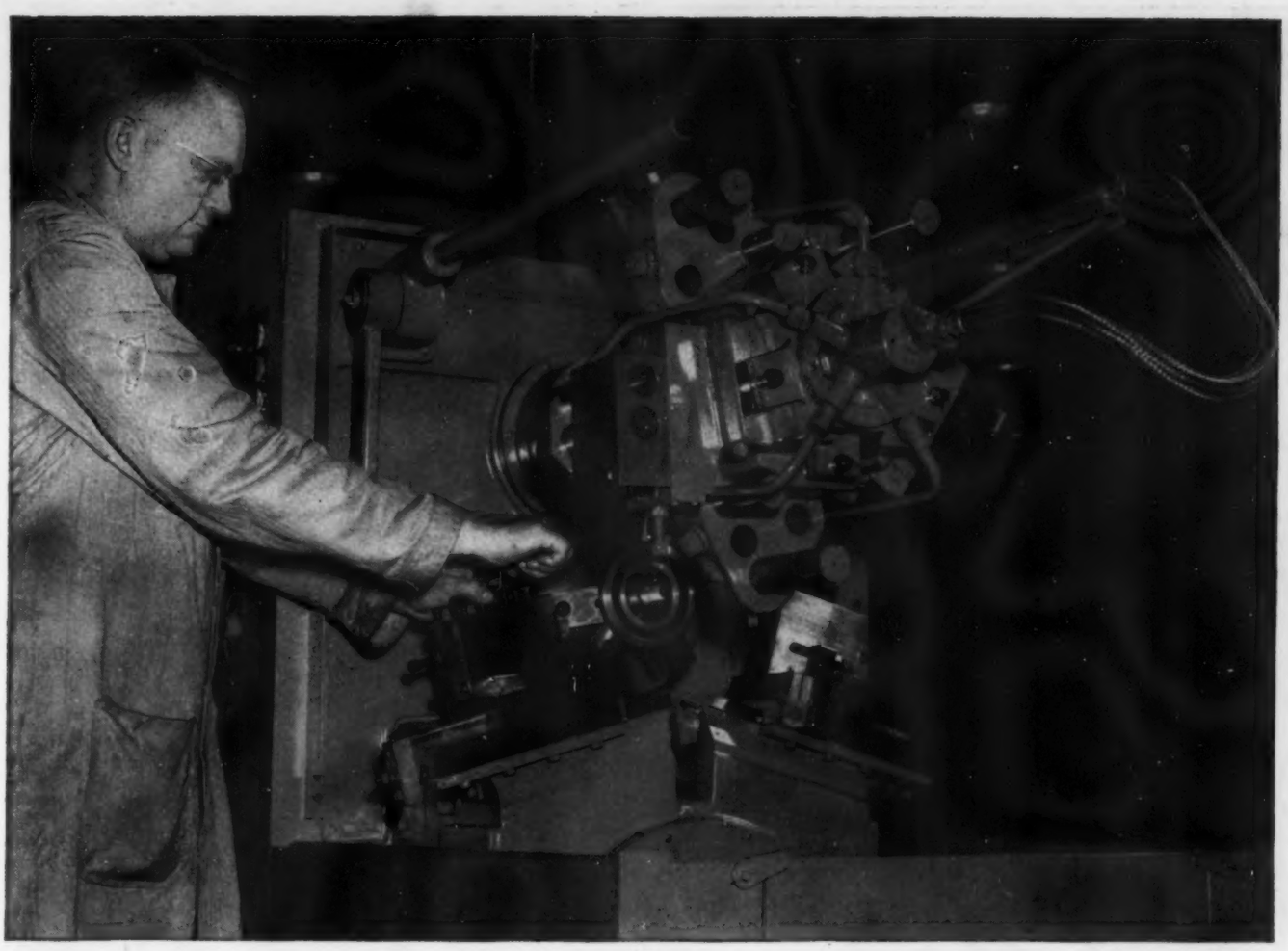
Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

Mills: Baltimore, Md.; Chicago, Ill.; Detroit, Mich.; New Bedford, Mass.; Rome, N. Y.

Sales Offices in Principal Cities, Distributors Everywhere.

Nothing pleases Revere more than to be able to sit down with a customer and discuss fabrication methods and end uses. Such friendly collaboration often has resulted in increased production, lower costs, an improved product, or all three. In one case, substitution of leaded brass for yellow brass was suggested, for greater ease in blanking and to reduce the need for dressing down with a file after assembly. In another, a slight change in gauge reduced material cost. In still another, a different temper eliminated one anneal. The Revere Technical Advisory Service will be glad to work with you on your problem.



THIS SINGLE SPINDLE AUTOMATIC *Answers* A SPECIFIC PRODUCTION NEED

For years many machine shops have operated without a machine to fill the gap between the production turret lathe and the conventional automatic. The turret lathe was fine for short runs —the automatic for volume. But neither was ideal for medium-sized lots.

Then Warner & Swasey introduced the Single Spindle Automatic which eliminated need for changing cams for different jobs.

It was big news then. Industry welcomed the machine that provided the flexibility of the turret lathe *and* the economy of the automatic.

And many other features will keep it big news for a long time to come!

Camless operation cuts setup time and accessory inventory to a minimum.

Adjustable trips and pick-off gears automatically control spindle speed ranges and all turret and cross slide functions. Shockless turret indexing and rigid construction preserve original accuracy. Skip indexing eliminates unnecessary approach strokes.

DOES AWAY WITH CAM CHANGING!
Quick-set Control Drum is easily adjusted to govern feed and speed selection and length of stroke.

But that isn't all. For full details on this first "different" automatic, write, wire or phone

WARNER & SWASEY
Machine Tools
Cleveland

You can Machine it Better, Faster, for Less... with a Warner & Swasey

TURRET LATHES, MULTIPLE & SINGLE SPINDLE AUTOMATICS, PRECISION TAPPING & THREADING MACHINES

Bliss Inclinable Press No. 21½ (left) and V & O Inclinable Press No. 5 (right) shown anchored on UNISORB at Berger Machine Company, Maspeth, N. Y. Formerly, this company anchored machinery with lag screws on wood floors or with bolts set in holes in concrete floors.

Prior to moving into their new plant, Berger tested the *modern* way to mount machinery — on UNISORB. A number of inclinable presses of different sizes were chosen for the test. In the standard manner, the feet of the press were cemented to UNISORB pads, which in turn were cemented to the floor. After 6 months of working at top speed on practically a 24 hour a day schedule, the presses were anchored as firmly as ever.

All Berger presses and other machinery are now mounted on UNISORB. The company has noted 75% savings in time and labor installing and repositioning machinery. Couple these savings with reduced wear and tear on machinery and buildings (UNISORB absorbs from 60% to 85% of transmitted vibration and noise) and we think you'll see your way toward important savings for *your* company.

Write today for sample and specifications. Ask for your copy of "Why It Pays To Anchor Your Machines With UNISORB."

THE FELTERS COMPANY

210-N SOUTH STREET, BOSTON 11, MASSACHUSETTS

Offices: New York, Philadelphia, Chicago, Detroit
Sales Representatives: San Francisco, St. Louis
Mills: Johnson City, New York; Millbury, Mass.; Jackson, Mich.

Only the original Modern-Magic Chucks and Collet Equipment carry the name "Modern-Magic". Manufactured by Modern Tool Works, Rochester, New York

MODERN-MAGIC

Quick Change

CHUCKS and COLLET EQUIPMENT

Modern Precision Tools Include . . . . .

- STATIONARY SELF-OPENING DIE HEADS
- ROTARY SELF-OPENING DIE HEADS
- STATIONARY COLLAPSIBLE TAPS
- ROTARY COLLAPSIBLE TAPS
- MODERN-MAGIC CHUCKS AND COLLETS
- SELF-OPENING STUD SETTERS
- INSERTED BLADE FACE MILLING CUTTERS
- SOLID ADJUSTABLE DIE HEADS
- ADJUSTABLE HOLLOW MILLING TOOLS
- UNIVERSAL CHASER GRINDING FIXTURES

The set-up shown above is typical of the increased production obtainable using Modern-Magic Quick Change Chucks and Collet Equipment. Here, the two spindles of the machine, Modern-Magic equipped, perform four separate operations. The tools are quickly and easily changed while the machine runs at operating speed. You don't even have to slow it down.

Simple, advanced design makes Modern-Magic Chucks and Collets practically trouble-free. Sturdy, fool-proof construction insures longer, accurate service.

Try Modern-Magic Quick Change Chucks and Collet Equipment on your next close-figured job. Prove their higher production, lower cost operation to your own satisfaction.

Write for full information covering Modern-Magic Quick Change Chucks and Collet Equipment

MODERN TOOL WORKS

DIVISION OF

CONSOLIDATED MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

SPUR GEARS
•
Helical Gears
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Bevel Gears
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Mitre Gears
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Internal Gears
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Worms
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Worm Gears

Sprockets
•
Ratchets
•
Splined Shafts
•
Racks
•
Segment Gears
•
Lead and
Feed Screws

CUSTOM BUILT TO YOUR SPECIFICATIONS

Adams Gears Are Right For The Job

Whatever the application, it's vitally important to use the *right* gears to assure smooth flow of power and proper distribution of load.

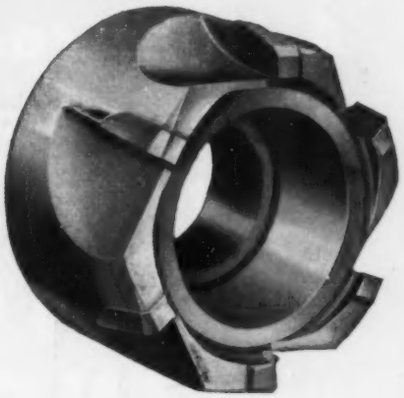
Let Adams gear specialists assist you in determining the best gears for your requirements. Adams gears are made to exact specifications to improve performance standards of your product, reduce assembly time and production costs. For complete details, write THE ADAMS CO., 1942 Bridge St., Dubuque, Iowa.

The ADAMS Compa
Dubuque, Iowa, U. S. A.

GEARS

FINE GEARS MADE TO YOUR SPECIFICATIONS . . . ESTABLISHED 1883

if it's a l-o-n-g hard pull



USE BARBER-COLMAN CARBIDE-TIPPED MILLING CUTTERS

This solid, continuous cut in cast-iron, straight across a flat surface, is an ideal operation for B-C Carbide-Tipped Shell End Mills. Cutting Teeth, constantly engaged in the cut, need diamond-hard, sharp cutting edges to keep pace with production requirements. Constant contact with the material and the abrasive action formerly made frequent sharpening necessary with High Speed Cutters.

With B-C Carbide Shell End Mills, now used on the job, tool life is increased from 30 to 200 pieces per cutter sharpening, and production is increased 2 to 3 times over what was formerly obtained with HSS cutters.

Perhaps there are ideal conditions for carbide milling operations in your production lines. Carbide cutters cannot be expected to show improved results on all milling jobs, but under certain conditions they show definitely superior production advantages. Why not send us specifications on one of your jobs, and let us recommend and quote the proper carbide cutters for your consideration. Call your nearest Barber-Colman representative today.

Barber-Colman Company

GENERAL OFFICES AND PLANT 167 LOOMIS ST., ROCKFORD, ILLINOIS, U.S.A.

JOB FACTS

Operation — Face mill four sides of machine table, each surface 2′ wide x 27′ long.
Material — Cast-iron.
Cutters — B-C Carbide Tipped Shell End Mills.

	HSS Cutter	C-T Cutter
Feed	3′ per min.	8½′ per min.
Speed	45 S.F.M.	210 S.F.M.
Cutting Time	80 sides in 10 hours.	140 sides in 10 hours.
Tool Life	30 pieces per sharp.	200 pieces per sharp.

BARBER COLMAN

MODERN MACHINES DEMAND *Modern* CUTTING TOOLS

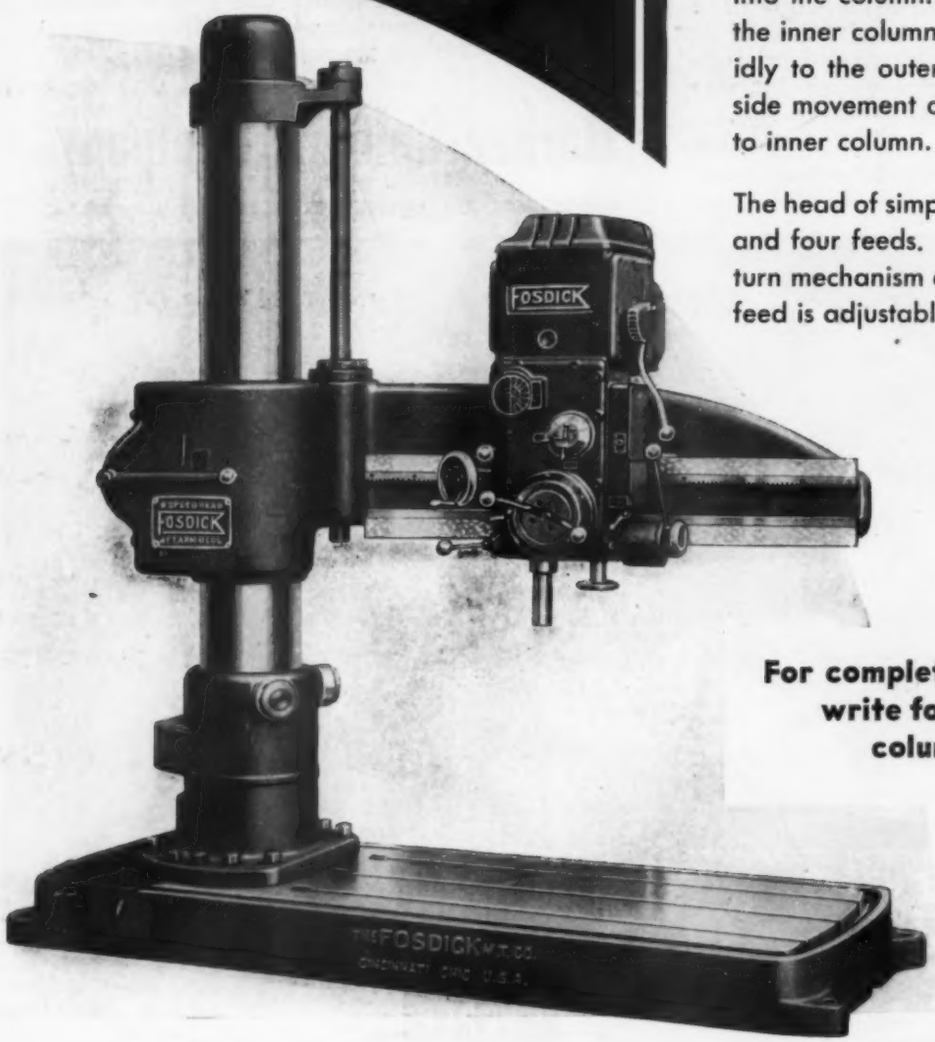
A light radial has been added to the FOSDICK LINE

● This recent addition to the Fosdick line meets the need of industry for a light Radial. This machine is similar to the Fosdick standard line of radial drills.

The arm is raised and lowered by an electric motor—the raising, lowering and clamping of the arm is electrically interlocked—A single lever is used to control all of the above functions. An electric column clamp is standard equipment and is operated by means of a push button.

A new column design replaces the conventional split column type which uses a sliding shoe fitted into the column. This shoe applies pressure to the inner column, locking the inner column rigidly to the outer column, and preventing any side movement of outer column with reference to inner column.

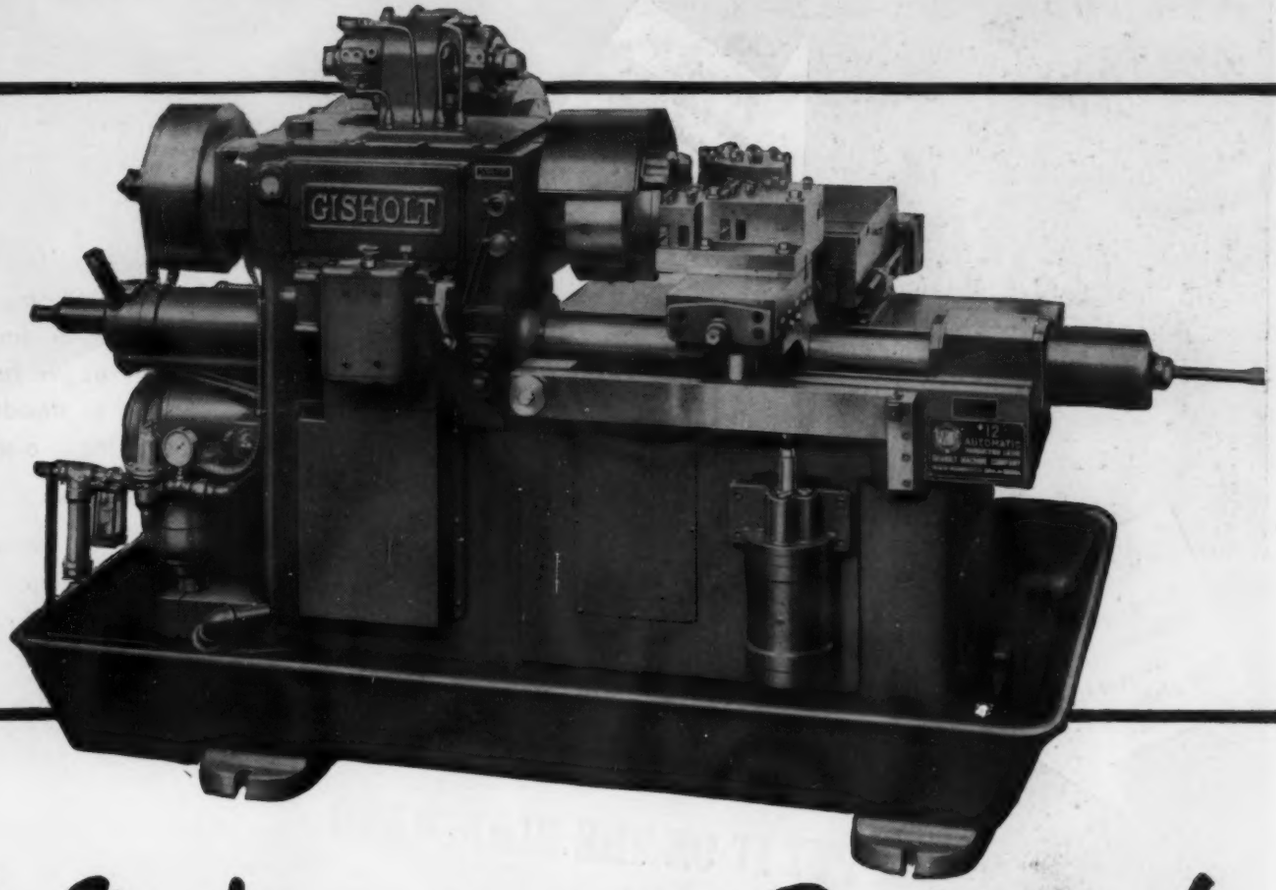
The head of simple design provides nine speeds and four feeds. The feed clutch and quick return mechanism are of entirely new design and feed is adjustable from the outside.



For complete detailed construction write for Fosdick 3'-4'-5'-11" column bulletin R.D.A.

FOSDICK MACHINE TOOL Company
CINCINNATI 23, OHIO

GISHOLT NO. 12 HYDRAULIC AUTOMATIC LATHE



the Simple way to step-up Production!

If you have large volumes of parts to duplicate within close limits of accuracy, investigate the Gisholt No. 12 Hydraulic Automatic Lathe.

1 ***Fully automatic.*** The operator has only to load and remove the work.

2 ***Easy set-up.*** Partial cuts can be taken without running the machine through the entire cycle. It is always easy to arrange tooling to best advantage.

3 ***Versatile.*** Ideal for chucking, between-centers, or fixture-held work. There is no changing of cams or gears for different jobs.

4 ***Fast.*** All tool movements are performed by hydraulic pressures, including rapid approach, feed during cuts, fade out and rapid return. Productivity is increased by extreme rigidity that enables you to take multiple cuts smoothly and without vibration. Time of the whole operation is equal to the time of the longest cut.

These are but a few of the reasons why the Gisholt Hydraulic Automatic Lathe is first choice in many of America's foremost machine shops. Write for complete information.

GISHOLT MACHINE COMPANY
Madison 3, Wisconsin

The GISHOLT Round Table
represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHIN

W-964
CONNECTING RODS
STEEL FORGINGS—
Grind both ends, both sides. 360 pieces per hour.
W-955
TYPE 2 V. O.
CRANK, BRASS—
Grind 2 sides to .002". 48 pieces per hour.
They were all held on the Blanchard and ground at a profit
PUT IT ON THE BLANCHARD
W-946
CLAM SHELLS
ALUMINUM—Grind 1/16" to seal surface. 200 pieces per hour.
W-947
CLAM SHELLS
ALUMINUM — Grind off 1/16" approx. 200 pieces per hour.
W-970
TOP MAIN FRAME
ALUMINUM—Grind .070" from 2 sides. 14 pieces per hour.
Thousands of similar jobs—requiring grinding of odd-shaped work held in fixtures — are being profitably done on Blanchard Surface Grinders.
If the surface to be ground can be brought to the wheel, a method can be devised to hold almost any piece for Blanchard Grinding. Let us assist you — Blanchard Service is Free.
BLANCHARD
The BLANCHARD MACHINE COMPANY
64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

4-Man Shop with a FUTURE

● This small shop houses a successful and growing business due to continuous high standards of accuracy.

Quality equipment pays the small operator as well as the large.

The Schoening Machine Service, 3284 Dunn Street, Cincinnati, Ohio—business, production machining—small in size—big in accomplishment—testifies to the value of fine tools.

The Cincinnati Bickford Super Service Upright Drill, illustrated, is drilling five $\frac{11}{32}$" holes and four $\frac{11}{32}$" holes to a plus or minus .005" tolerance in a steel cover $\frac{5}{16}$" thick—a production job.

Mr. Schoening tells us he has held accuracy to a plus or minus .0002" on production reaming jobs.

Write for Bulletin No. U-25.

THE CINCINNATI BICKFORD TOOL CO.

RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES

Radials 7½" dia. col. 2½" arm to 36" dia. col. 12" arm.
General purpose Uprights 21" to 28" sizes.
Production Uprights 21" to 28".
Jig Borers. Portable Horizontals.
Spacing Table Machines.

Equal Efficiency of Every Unit Makes the Balanced Machine

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio U.S.A.

REEVES Variable Speed Transmission

Above: Accurately controls baking time of bread in direct gas-fired tunnel oven.

Above: Maintains constant tension, reduces stretch of yarn on slasher in textile mill.

Above: Regulates speed of rotary table on welding positioner, for continuous weld.

Left: Provides infinite speed adjustability on lumber planer and matcher.

Above: Varies speed as required in filter processing of synthetic rubber.

Provides infinite, accurate speed flexibility within 2:1 to 16:1 ratio

Proved in thousands of installations in scores of industries, REEVES Variable Speed Transmission is the original compact and mechanically correct unit which drives production machines at infinitely variable speeds—making available instantly the most efficient speed for each different operation. It covers the entire speed range smoothly, without steps and without interrupting production . . . maintains any desired speed without fluctuation. Available in sizes fractional to 87 hp, both horizontal (illustrated) and vertical types, either open or enclosed designs. Choice of manual (handwheel), electric remote (push button) or entirely automatic controls.

Also in the complete line of REEVES Speed Control equipment are two other basic units—the Motodrive and the Vari-Speed Motor Pulley—likewise offered in the widest selection of designs, sizes, speed ratios and controls.

By providing the right speed for every job, under every changing condition, REEVES Speed Drives are assuring better quality products, higher rates of production and lower manufacturing costs in more than 260,000 widely diversified industrial installations and as standard equipment on more than 2,100 different makes of machines.

A REEVES engineer experienced in your field will be glad to consult with you. For information on the entire REEVES line, write today for the comprehensive 114-page catalog A-450A.

REEVES PULLEY COMPANY • COLUMBUS, INDIANA

Recognized Leader in the Specialized Field of Speed Control Engineering

ACCURATE • VARIABLE

Reeves Speed Control

GIVES THE RIGHT SPEED FOR EVERY JOB!

SPOT NEWS OF METALWORKING

A Vienna arsenal contains 180 U.S. lend-lease machine tools shipped there by Britain contrary to her agreement not to export them after they had been sold to her after the war at 23 cents on the dollar of the original cost, according to Charles Simmons, president of the Simmons Machine Tool Co., who is just back from Europe.

One large plane engine manufacturer will build no more reciprocating engines for the government. Jet-type engine is essentially a sheet metal stamping job with a minimum of machining. Result will be high production with relatively small amount of equipment.

New "progressive" cylinder machining unit advances the work automatically station to station. It is built in sections any one of which can be operated independently thanks to hydraulic operation and electronic control. It has built-in chip conveyors, designed so that it easily can be changed if product design changes.

An average cost of 14 cents an huor, on top of the high regular hourly rates, is being paid by a group of Midwestern metalworking manufacturers for so-called "fringe" privileges, such as holidays, pensions, paid vacation. Overtime is not figured in this cost. Some companies in the group average as high as 28 cents an hour.

> **Russian-pressured trade deals with Sweden have been an indirect blessing to the Italian ball-bearing industry. Sweden's SKF has been so busy filling Russian orders that they have been unable to handle requests for ball bearings from other countries. Thus, large ball-bearing orders have been directed to the Italian industry from Britain, northern European countries and Latin America. As a result, the Italian industry is making great strides in its postwar struggle to get back on its feet.**

Trend of the times—an important medium-priced carmaker has fully stocked its dealers and is reported to have several thousand new cars stored on open lots in the Detroit area. As a result, it recently has cut back production.

Ford Motor Co.'s intention to discontinue a 20-minute paid lunch period is permissible under its contract with the CIO United Auto Workers, Umpire Harry Shulman has decided.

The Taft-Hartley Labor Law is working well, the Senate-House Joint Committee finds, and no changes are proposed in the legislation before next year. However, strikes increased during January to 175 approximating the 1935-39 average for that month. Except for October, this was the first monthly rise since last April.

Watchmen fall in the classification of plant guards and may not be mixed in a bargaining unit that includes, or belongs to a union which admits, non-guards. This was decided in a case involving a New Jersey refrigerator manufacturer.

Built during the war, into the greatest in world history, the U.S. Merchant Marine is slowly sinking back where it may have difficulty in maintaining its rank as a first-rate maritime power. Present outlook is that only 40% of U.S. trade will be carried by the end of the year in American bottoms. This compares with 30% in 1939. Top reason for this decline is we are building up fleets of 16 ERP nations by turning over to them as much shipping as possible.

Shot peening of aluminum to increase its physical characteristics is being studied in the automotive field. The process works on steel but the use of the technique is definitely new to aluminum.

Despite holding an enviable position in regard to steel, Kaiser-Frazer is building dies to die cast aluminum doors and will be ready for production runs in June. The company is also switching to aluminum as rapidly as possible for other parts.

Gaging Metalworking

Machine Tool Sales Rise

Machine tool orders in February are believed to have been higher than in January, which showed an increase over December. New orders in January stood at 146.3 on the new index of the National Machine Tool Builders' Association (1939 equals 100). In December the figure was 142.3.

Shipments last month also picked up, according to preliminary checks. January shipments were 132.9, compared with 173.1 figure in December, 1947.

Since new orders in January outstripped shipments, unfilled orders rose. They hit 715.6 on the index, as against 711.3 during December. Cancellations were very light.

Price Advances Stmulate Orders

Recent brisk business in machine tools is traceable to two factors: the placing of large orders prior to price advances announced by some builders, and active buying by important domestic customers, including at least one big automobile company. Machine tool builders are faced by the prospect that production costs this year will be unusually high. This is due partly to the fact that they are just going into production on many new models. The first units in a new-model run, in machine tools as well as in automobiles, always cost more than ones produced later on when things get rolling.

Third-Round Talks Watched

The metalworking industries are more absorbed at the moment in the "third-round" wage problems than in anything else. Many smaller companies have made settlements which range from five cents an hour up to 15 cents. But the real "tip-off" as to what to expect will come when agreements are reached by the automotive and electrical goods manufacturers.

Automobile makers seem in no hurry to make a settlement. The feeling is that no major strikes will be precipitated and that management may yield 10 cents to 12 cents an hour in direct wage increases and in so-called "fringe" concessions.

Close Eye on Inventories

Metalworking production continues at a record rate, but management is more alert than ever watching for signs of possible weakness in demand. Manufacturers are keeping a close eye on inventories and are unwilling to make other than relatively short-term commitments. Meanwhile the changeover from a seller's to a buyer's market is rapidly drawing near in many metalworking items. That in itself will spell a more cautious attitude all around.

Detroit Less Confident

Though top automotive men talk confidently about huge backlogs of orders, they are fearful that a buyer's market is close at hand. It will come first in the higher-price cars, and actually is here in the case of one manufacturer with cars priced upward of $2,000.

Signs pointing to a relatively early end to the lush times for Detroit are these: (1) heavy-duty trucks are getting harder to sell, (2) dealers are finding it necessary to call several pepole on the waiting list before they discover one willing to take immediately the car which was ordered months ago; (3) the used car market is easing off considerably pricewise; and (4) prospective car buyers who inquire about a new car today are surprised at how many "makes" can be delivered to them with only a short waiting period.

Early Switch to Buyer's Market

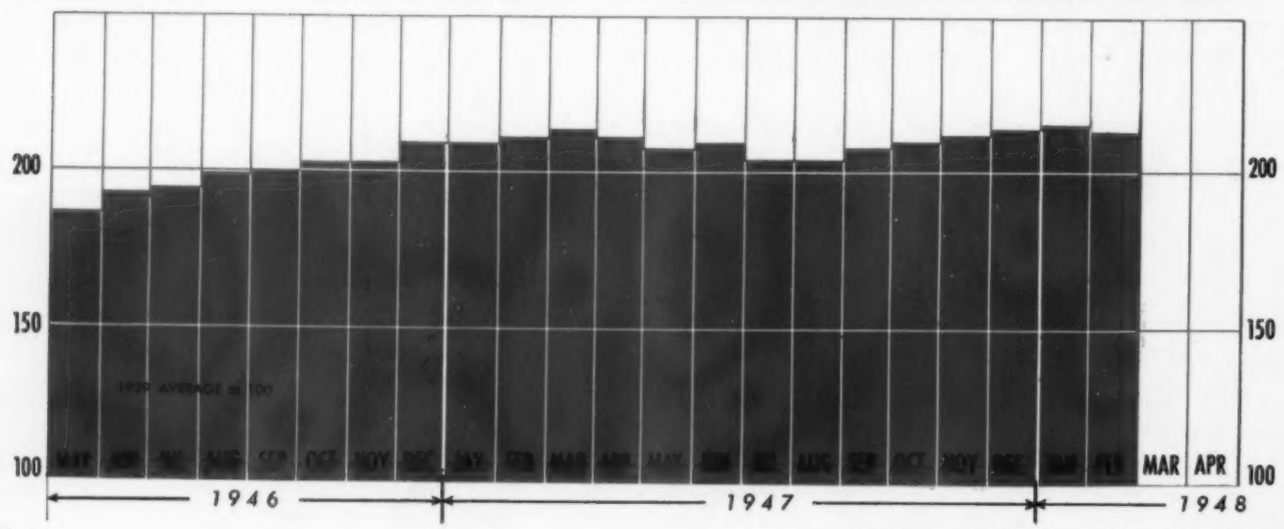
What Detroit is afraid of is that the switch to a buyer's market in general will come fast when it occurs. Many executives are of the opinion that recent price rises have tended to price some of the new cars out of the market sooner than expected.

Not that the bottom is about to drop out of the automobile industry, Not that Chevrolets, Fords and Plymouths will not sell at peak volume the remainder of this year. But officials are watching hawk-like for every indication that sales may be beginning to slip so that they can adjust their plans accordingly.

Five-Million-Car Year in Doubt

Until recently talk in automotive

American Machinist INDEX OF METALWORKING PRODUCTION



circles centered about whether enough steel would be available this year to build 5 million cars or perhaps more. Now opinions differ on whether sales for the year can be sustained at a 5-million-car pace. Some pepole inside the industry are convinced that the year will wind up with an output of only 4½ million units.

Orders for automotive replacement parts are down about 15% from a year ago. On the other hand, parts orders for original equipment continue at a high rate. That is a favorable sign that car manufacturers have not yet translated their nervousness into action to curtail parts shipments.

Big Three Will Gain

Detroit is debating whether the car "selling war" will start in earnest by midsummer or whether it will come nearer the year-end. No one, however, doubts that it will be waxing furiously before 1949 sets in. And then will occur the real test of what car makers are able to survive under competitive conditions.

On one point Detroit is agreed: it is only a matter of time until the Big Three (General Motors, Ford and Chrysler) improve their relative standing at the expense of the independents.

Czech Crisis Hits Builders

The Czechoslovakian coup hit hard a number of machine tool builders who had orders on hand for delivery to that country. It appears unlikely that the machines completed and in process will be shipped, because the U.S. government will deny export licenses.

No official word has been issued, but it is reasonable to expect that Washington will reimburse financially the builders who have worked on special machines for Czechoslovakia which cannot be adapted to uses by other customers. It is doubtful whether this assistance will be extended to companies producing standard machines which can be resold to other buyers.

Tool and Die Backlog Up

Tool and die business is going along at a fair pace. In January, shops had the first upturn in backlogs in more than a year. The increase was not much, but was a welcome change from the long-continued decline. It is estimated that the unfilled orders gained a bit in February, too.

Employment in the nation's tool and die shops has been almost constant since last August. More hours were worked during January and February than in December. An important group of tool and die manufacturers is not too optimistic about the outlook. Some 35% reported the outlook. as good, and 50% said it is only fair.

Job machining done by the tool and die industry represents about 15% of total production. The percentage, however, varies widely among different industrial centers.

Malleable Foundries Hit

Malleable foundries are operating 5% to 10% below capacity because of the continued shortage of the three basic elements going into their products: pig iron, coke and scrap. Backlogs extend into months rather than weeks, as during prewar, but are off about 10% from a year ago.

Labor supply for malleable foundries is good. There is just one sign which is disturbing: number of inquiries which may be translated into orders is slowing down. Prices remain stable. The situation in gray iron castings is pretty much like that in malleable.

It's much easier to get more production
when the machine is designed for it . . .

MORRIS
HORIZONTAL
Eight Station Automatic
INDEXING MACHINE

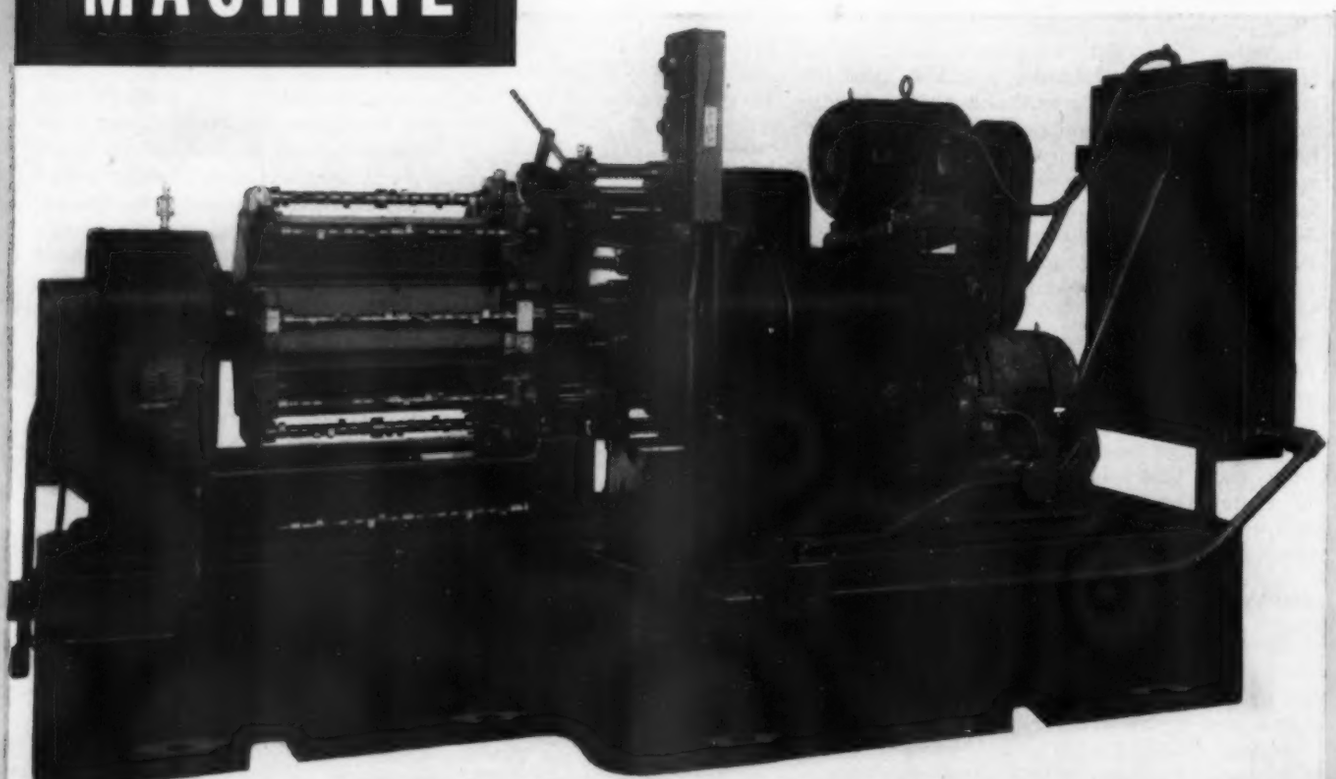
When you are confronted with the problem of reducing costs to meet competitive figures on mass production work, you most often find the only answer is a machine designed and built to handle a specific job.

Here is a typical example of just that. This Morris Mor-Speed Machine is designed to drill—ream—counterbore and tap four holes in the flange of an automobile camshaft on a mass production basis.

It has eight stations—indexing is automatic as are all other functions of the machine except loading—unloading and clamping the work by hand. This hand operation is accomplished while the tools are working on the other seven pieces of work. There is no lost time and you get a finished piece at each index of the machine.

If you have a job which requires high production consult Morris they have the engineering "know-how"— experience and facilities to design, develop and build high production machines for specific jobs.

Write for complete details.



Builders of MOR-SPEED *Line*

The MORRIS *Machine Tool Co.*

CINCINNATI 7, OHIO

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Competition With A Bang

Competition is back with a bang. The day of the seller's market is rapidly fading.

If you doubt it, visit any of the nation's industrial centers and see for yourself what's going on.

Detroit is a prime example. The fabulous demand for automobiles is not quite so fabulous as it was.

Ask manufacturers of some cars retailing upwards of $2,000 for an honest answer to the question, "Do you still have a mile-long waiting list of customers?"

The old competitive prewar spirit is beginning to permeate Detroit. Each manufacturer keeps a close eye on the other fellow.

Not that 1948 will not be a big year. It will. But motor car makers are jockeying for advantageous positions in the red-hot selling campaign not far ahead.

Go from automobiles to household appliances. The "pipeline" is steadily filling with refrigerators, irons, washing machines and vacuum cleaners.

It will not be long until production of all of these items will be geared to current sales volume. The lush period of catching up with back orders will be at an end.

The present intensive sales battle in the radio industry then will spread to other industries. And that means that retail prices will come down as the fight for customers heightens.

It is no secret that manufacturers in many lines are bent upon getting volume. As long as they can get it at present prices, those prices will stay.

When enough buyer resistance is set up, however, price concessions will be offered to hold up the volume to a high level.

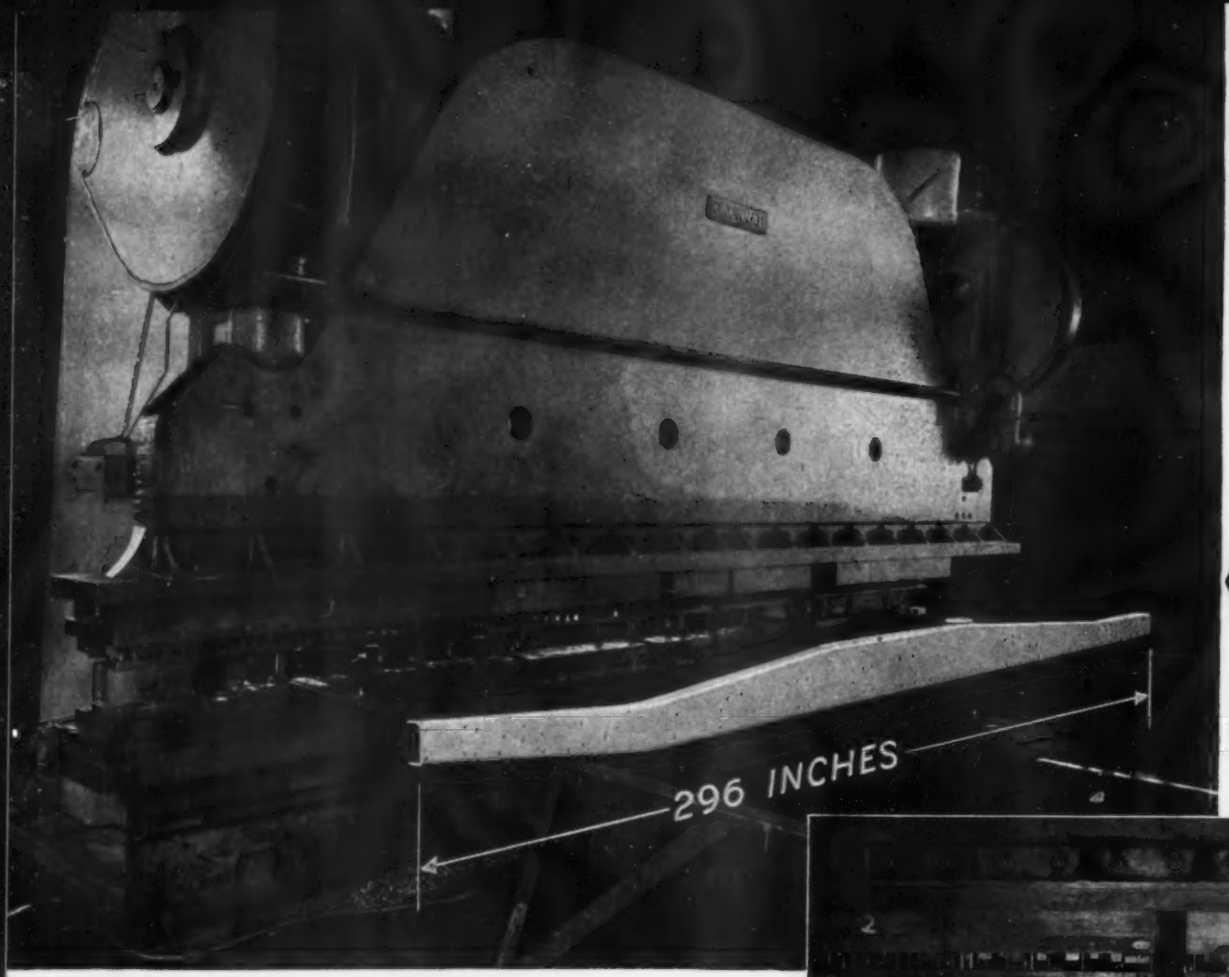
Those price cuts will be achieved by two means: (1) redesign of the product to make possible its output for less money; and (2) a considerable slicing of manufacturing costs by installation of more efficient production methods, including machinery, insuring higher productivity per man.

With lower profit margins looming, wise management will examine closely its sales plans and sales organization to insure the greatest possible sales of its product. It also will equip its factories with the latest postwar machines which yield maximum output at minimum labor cost.

The only safe thing to do is to act on the premise that competition, after an absence of seven years, is back with a bang.

Burnham Finney

EDITOR



Material: ¾" mild steel. Maximum number of holes: 104. Maximum diameter of hole: 1⅛".

A close-up of the punch and die setup which gives 116 combinations.

PHOTO—COURTESY YOUNGSTOWN STEEL CAR CORP.

PUNCHING

104 HOLES EVERY 10 SECONDS

The multiple punching of these holes must be very rapid; however, another important requirement is the maintenance of accurate location, and the spacing of one hole from another.

The assembly which follows is smooth and certain—no costly misfits on these 24-foot trailer frames.

On this Cincinnati Press Brake the spacing, the number of holes or the size of the holes may be changed quickly and economically, as required . . . or the brake may be used for many other operations—all accomplished with minimum time loss and at low cost.

Write for Catalog B-2. *It illustrates many applications for the press brake and press work performed on Cincinnati Press Brakes.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

Profit Sharing Can Work in a Free-Enterprise System

Properly presented profit-sharing plan ups productivity, stimulates ideas, creates cooperation, improves quality and cuts rejects

BY CARL A. NORGREN
President
C. A. NORGREN CO.

TWO GENERAL principles, prominent in the backdrop of the stage on which our national economy is built and without which no labor-relations planning can possibly succeed, are: (1) the full intimacy of wages, prices and employment; (2) production as the touchstone of economic progress.

Recognizing the truth of these principles and believing that optimum employment for all who desire work is essential to domestic peace, security and progress, we, in our company, determined after V-J day to avoid involvement in the labor-situation mess—where labor was scarce and rebellious, management bitter and bewildered, and the government badly rattled.

Prior to the war, our company had experimented with a number of bonus plans, but other than pleasing our employees somewhat on a temporary basis they were not basically successful. Any variation from, or reform in, a relationship so basic as that of employer-employee must be based upon sound premises which square with economic facts and must be specifically applied to an individual plant.

No incentive plan, scheme or system has yet been devised which can be applied successfully to all industry, no matter how effective it may be in an individual case. If we use the two general principles as a springboard, however, specific applications may be worked out to fit almost any industry.

Before examining further the more intimate details of our own incentive plan, let us examine some things which caused industry and public "to take one hell of a beating" in the past several years.

It is axiomatic in industry that a surplus of jobs and a shortage of labor contribute to industrial inefficiency. When jobs are hard to find, workers are inclined to stay on the job. By staying on the job and giving close attention to it, workers are generally more efficient than when the reverse is true.

Although 1939-1940 cannot necessarily be taken as a high point in labor efficiency in the country, we can at least use that period as a basis on which to make comparisons with respect to what has happened subsequently. We had not at that time reached so-called full or optimum employment, and jobs were generally not so plentiful as labor.

With advent of the war, this situation changed overnight. Labor became restless, constantly seeking higher levels and greener pastures. As time went on and in spite of every effort to prevent it, there was a fluidity of labor movement over the entire United States unparalleled in our industrial history.

Labor turnover reached an all time high. In our own plant at one time it exceeded a rate of 200% annually. When you consider that a considerable number of our men were old employees, it gives an even more shocking idea of the rapid turnover.

It is obvious that no new employee, no matter how good, can be as productive as an old employee of equal capacity. This, combined with the fact that a tremendous percentage of the new employees were folks who were not industrially minded but only attracted to industry in the hopes of high wartime wages, rendered efficiency quite impossible. Industry as a whole over these years suffered a decline in production per manhour of 20 to 40%.

In an atmosphere of shifting labor personnel, it is equally obvious that plant loyalty, pride of pro-

duction and quality as well as unit quantity suffer materially. Low production per manhour, wastes from rejected materials, rework materials and other extravagances growing out of indifference, all contributed to mounting costs grossly disproportionate to the American tradition and potentiality.

For a half century or more, industry has been progressively producing more goods with fewer hours of labor, at a lower cost to the consumer. The past few years have witnessed the first major reversal of this basic contribution of free enterprise to world economy, and more specifically in its contribution to the highest living standards the world has ever known.

If we are to reverse this negative trend and again start the march of progress toward greater real incomes for more people and lower costs and higher living standards for all people, then we must certainly replace the decadent elements which have crept into the American economy during these past few years. We must recreate an atmosphere which will stimulate again those attitudes which have made our free enterprise economy great.

We have given much lip service to the proposition that the industrial development of the United States on which our free economy is built is fundamentally based on the free enterprise system.

By freedom of enterprise I mean the inalienable right of every citizen to go forth wherever goods and services may be exchanged, and carry on such trade without restraint, except for the observance of duly enacted laws and a common decency in observing the rights and prerogatives of others.

I mean the right of every young man to start with a shoestring and an idea, backed by courage and a fully justified sustaining hope, and to run that shoestring into a fortune.

I mean the opportunity for all young people of whatever station in life to rise above their humble beginnings to whatever heights native ability and hard work will carry them.

I mean the challenging inspiration of an untutored Lincoln rising from the ashes of an open hearth to the presidency of these United States and immortality.

I mean above all an unshackled spirit firing the hearts, hopes and visions of youth in the unquestioned right to challenge its own destiny.

I mean freedom of enterprise!

Fundamentally, I believe this concept is correct. Industrially, however, there is a point which has been persistently overlooked. This is understandable and excusable during that long period in which our expanding economy meant concurrently an expanding and rising living standard, with increased wages and labor income.

This parallel movement led us all to believe that everyone was sharing in the business of free enterprise on a somewhat equitable basis. But we have now reached the point where a more particularized definition of free enterprise in its relationship to labor earnings is in order.

As long as men work on a fixed-wage basis, the immediate increased reward of improved productivity, methods, management and processes can only accrue to industry ownership—and indirectly to the employee as a part of the public in lowered prices.

To make free enterprise really effective, some participation or incentive must be provided so those who perform the job of production can find in their work a motive for self improvement, higher efficiency, salvage of waste, forward thinking and all the other attributes which are fundamental and essential in an enterpriser if he is to succeed.

If management alone can profit by such improvement, the individual worker naturally settles into an attitude of giving an honest day's work for an honest day's pay. It is only when he feels that he has a personal stake in improved efficiency that the worker will give to his job that attitude which will produce higher results.

There are any number of ways in which incentive pay may be devised, depending on the plant itself, the type of product, quantities involved and all the other imponderables of industry. Our own plant is not large enough for equitable piece work, and our work is of such character that incentive pay must be based on over-all plant efficiency of production.

The plan we have adopted is not an over-all plan which can be made applicable everywhere. It has in it, however, the basic factors out of which a plan can be devised for almost any industry.

The Basis

Recognizing the intimacy of wages, prices and employment, as well as productivity, we started our thinking of incentive pay on this basis:

1. No incentive plan should be devised which would jeopardize sufficiency of income to the company to guarantee its continuity in the maintenance of jobs for all employees.

2. The going rate of wages in the area for comparable work must be paid. A bonus plan must not be used as a consideration in hiring personnel.

3. The incentive plan must provide a direct stake in any improvement of efficiency, lowered production costs, reduction of waste, salvage and rework to all qualified employees so there would build up in their minds a compelling feeling that they are working for themselves.

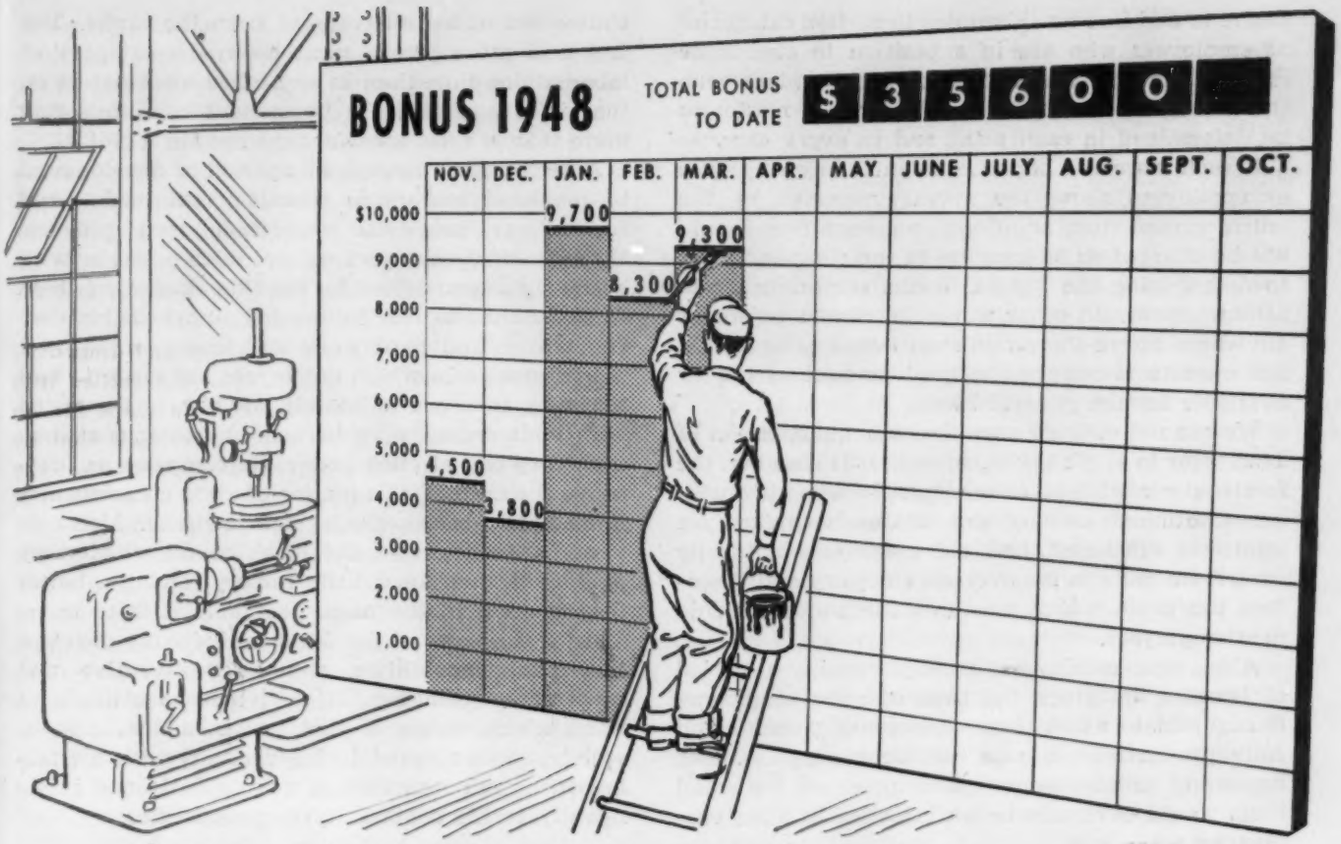
4. The plus values in earnings must be sufficient so they are an incentive and appeal to the fundamental human characteristic of selfishness, self-betterment and improvement.

Our plan, based upon this thinking, seems simple:

1. We pay the going rate of wages.

2. We have established a bogey of percentage of income, based on monthly sales, which is reserved for the company for interest on invested capital, repairs, replacement reserves and general maintenance of the business. This is a minimum net income on which the business can thrive.

3. All net income before federal taxes above the bogey requirements of the business is to be shared with the employees on a basis to be determined by the company.



Profit-Sharing bonus is posted each month in the factory so all employees can see where they stand. Monthly posting creates incentive factor—if bonus is not posted on time, employees want to know why and when

4. Eligibility to participate begins at the end of one year of service.

5. Individual bonuses are figured pro rata on the basis of the relationship of the total earnings of the individual to the total earnings of all eligible employees.

6. Owing to the uncertainties surrounding industry, our plan is set up on a voluntary basis for one year at a time. It must, however, be the serious intent of the company to continue this policy as long as earnings justify it, and not merely to use it as a temporary means of speeding up production to a higher level.

7. To avoid dissatisfaction or discrimination in event of discharge or separation of an eligible employee, all such former employees receive their full participation in the bonus for the interval in which they were qualified up to their separation.

Our incentive plan is based on payment of the bonus annually. It is figured on a fiscal year from Nov. 1 to Oct. 31 and is paid Dec. 15. This gives us 6 wks. in which to close the books and prepare bonus checks.

Yearly intervals of payment are too long for enthusiasm to continue unless there is a continuous definite indication of how the bonus accumulation is progressing. To this end we post in our shop a chart on which is noted each month the bonus credit for the month and the total accumulated to date.

This has an effect equivalent to frequent payments because the employee can see from month to month the accumulation as it occurs in dollars and, in his own mind, can calculate the extent to which he personally shares in it.

We have had many, many letters from our employees and almost 100% approve of the annual payment, because it helps them in their over-all annual liquidation of larger obligations such as payments on homes, purchase of refrigerators, radios and automobiles, and other large expense items. Many babies are budgeted on the basis of the bonus. One employee bought two pure-bred milk cows which earned $600 in 6 mo. He still has cows, calves and calves to come.

The practical effect is that the family lives comfortably on its weekly take-home pay, and its standard of living is predicated on the immediate available cash. The bonus then serves as a savings account. Although plans are made for its expenditure, we find little evidence of anyone hypothecating the future by spending the bonus in advance through excess credit buying.

Distribution of the bonus is predicated entirely on the total earnings of all eligible employees without special consideration for office, junior executives or administrative personnel. As differences in employment capacity are usually compensated for in salaries, the bonus of all categories is in direct proportion to their established income based on their contribution to the year-long activity of the company.

It is possible, in some instances, that plants may

desire to add increased bonuses to certain categories of employees who are in a position to contribute more to the over-all productivity of the plant than the average worker. This naturally is a matter to be determined in each plant and in every case.

If such increased bonus is given to any employee or employees above the average received by the entire group, such additional compensation should not be charged as an expense to the company prior to determining the general bonus responsibility to all employees. In other words, increased payments anywhere above the established bonus rates should not operate to reduce the total amount of money available for the general bonus.

We are not entirely sure that our qualification of 1 yr. prior to eligibility is correct. It is based on the fact that we wish to reward people who stay with us. Continued employment obviously makes for improved efficiency, and old employees naturally contribute more to the over-all efficiency and therefore the profit which produces the bonus than do new employees.

Also, new employees usually require a period of learning in which the time of older employees is required to assist them in becoming useful and fully productive units in the labor program. For beginning employees to participate on an equal basis would obviously be an injustice to older employees.

Some percentage participation to new employees, increasing over the year, may be justified, however, as a stimulant and to avoid the feeling of discrimination or envy when bonuses are distributed to eligible employees and those not eligible may not participate.

Another practical point that has to do with a period of apprenticeship before eligibility is its indirect, but nevertheless very positive, effect on the employment of people. It is extremely important that this plan shall never be interpreted as wages, but must always and definitely be predicated on a voluntary act on the part of the company, based solely on a formula of earnings.

If immediate bonuses are promised (and inferentially they usually are) when employees are hired, it has been ruled many times that such bonus becomes a part of compensation. Under our system of a qualification period, no one is employed with any idea that his wages consist of anything more than the hourly rate at which he is hired.

It is unfortunate that in the past decade or two, in spite of the basic freedoms which are America, a growing sense of class consciousness has been creeping in. This has been stimulated unfortunately and unnecessarily by large organizational labor activity and governmental attitudes.

Sure, we have a category which we know as labor, but in my opinion it is fundamentally un-American for even those whose activity falls in this category to consider themselves as a class. To do so, inferentially at least, denies or smothers advancement. The whole history of the American industry belies this attitude.

The vast majority of business leaders of the United States were developed from the ranks. The fact that more people must be in the category of labor at one time than in any other must not mean that it is necessarily a permanent condition, any more than a child must always remain a child.

A person goes through this period of development to manhood and more effective usefulness. And so, in our industrial experience men progress through every category of productive work, with every right guaranteed by the Constitution of these United States to rise to any height which his own capabilities and hard work will lead him.

In a system in which employees are made to feel that they are more intimately and closely associated with their organization because, by their contribution, they can at once better the company and improve themselves, this matter of class consciousness immediately becomes relegated to limbo. Men cultivate a feeling that the machine on which they operate is their own little factory, and the better they operate it, the more profitable it is to them.

An atmosphere of this kind instinctively develops individual capabilities, stimulates inventive and constructive thinking. It cultivates an attitude of mind which makes of that person a finer unit of society, more assured in his dealings with his fellow men, and contributing more greatly and intelligently to his community responsibilities.

Stimulates Cooperation

In our particular plant, where the bonus is predicated on over-all efficiency, it cultivates an extremely wholesome, cooperative attitude, a willingness and a desire to get along with fellow men. Because his own well-being is affected by his less productive associate, it stimulates each man to help others become more effective.

We feel that this is tremendously important. It is a step back in our ideology to the days of personal craftsmanship and neighborliness. It is an atmosphere in which America has grown to be the strongest bulwark of freedom in the world. It is an atmosphere which, if extended universally, can build an impregnable era of good will, permeating over-all industry and immeasurably strengthening America as a nation. Ideas and progress grow in the warm atmosphere of friendliness; nothing good can come out of a cesspool of fear, envy, resentment and hatred.

In this plan, and in any plan which is seriously intended to be an incentive program, there must be no flavor of paternalism. Under no circumstances should the worker be led to believe that he is an object of charity, or that the management is deserving of any special gratitude, or for that matter special consideration or treatment.

If an incentive program is to live up to its name, the plus value of increased earnings must be just that—*increased earnings*—produced by the employee himself through his own effort and therefore his as a matter of vested right.

With this attitude firmly intrenched in the mind of the employee, that in addition to working for the

company he is in fact working for himself, then and then only will incentive pay mean free enterprise in its broadest application and a vast multiplication of enterprisers in this country.

Although it is natural for all young men to want to work for themselves, economic requirements of a complex industry such as ours indicates that probably not more than 25% of all employed people can ever possibly work for themselves in the sense that they may be their own boss. This emphasizes the basic essentiality, if we are to continue to make free enterprise work, of creating an atmosphere that will make enterprisers in their own right out of the 75% of workers who of necessity must be nominally employed by somebody else.

What have been the results of our plan? In the past year, there has been an astonishing shift in attitude and atmosphere in our entire organization. First, we are producing a greater volume of merchandise with less employees in the plant than were required 2 or 3 yr. ago. 87 factory employees working 40 hr. per wk. are producing more now than did 140 working 48 hr. per wk. during the war.

There has been a most heartening increase in personal efficiency, a tremendous reduction in reject material, a great reduction in rework and salvage of material. A stimulating contribution to improved tooling and other speed-up methods which contribute to improved production has followed. A spirit of cooperation never before fully manifest, and a general attitude of intelligent forward-looking industry on the part of the individual is evident.

MONTHLY BONUS ACCUMULATION

Nov., 1946	$4303.79	May	9787.70
Dec.	3791.48	June	7444.53
Jan., 1947	9639.22	July	5624.21
Feb.	8222.29	Aug.	5726.37
Mar.	9341.80	Sept.	4603.67
Apr.	5711.25	Oct.	8907.19
		Total	**$83,103.50**

In spite of the fact that the cost of labor has increased more than 50% over the past 5 yr. and materials more recently have increased from 20 to 100%, we are today in a satisfactory profit category, with increased cost to our consumers of only 10%.

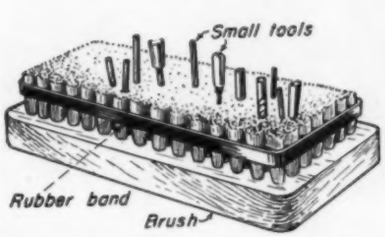
This is the first increase in our selling prices in the history of the company. This we feel is an important contribution even though it is a very small one, tending towards industry stabilization and the elimination of inflationary trends. We are opposed to any fortuitous or opportunist price increases merely because they may be had for the asking.

With the right kind of an incentive system, production can be improved, workers may earn more money, products may be made for less, and the consumer (who is, after all, all of us) will have more money to spend and that money will go farther. It would follow, therefore, that the standard of living, and real wages, may be progressively improved.

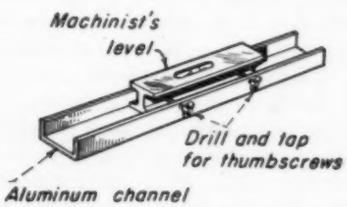
We like to feel that men leave our plant at night, questioning the effectiveness of their work for that day and planning for greater effectiveness tomorrow. This attitude of mind only an enterpriser enjoys; this attitude has made America.

Short Cuts FOR THE SMALL SHOP

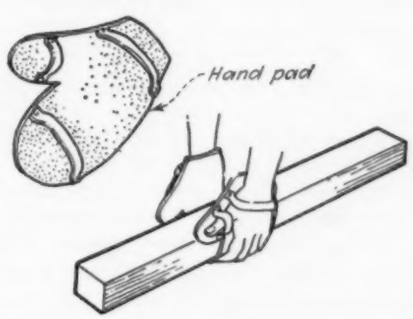
BY A. H. WAYCHOFF



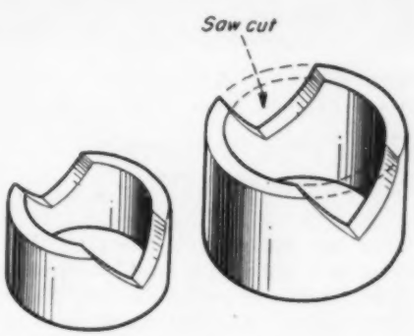
SMALL TOOLS can be safely kept ready for use in an old brush. A shoe brush will do. Place a heavy rubber band around the bristles to keep them bunched. Oil the brush and push tools down into the bristles.



TO EXTEND a machinist's level, procure an aluminum channel of the wanted length—even up to 8 ft. long. True the bottom. Drill and tap four holes at the central portion, two holes in each leg. Set the level in place and clamp in the level position with four thumbscrews. Wedges may be used under the level to set it properly. The "extended" level may be used for aligning shafting.



PROTECTIVE PADS for handling rough objects can be made from the sidewalls of old automobile tires. Cut the pads to the outlines of the right and left hands, and apply straps over the wrist, thumb and back of the hand. Much soreness and injury resulting from careless picking up can be avoided with these pads. They also permit handling objects too warm to touch.



OVERSIZE V-BLOCKS will prove handy accessories in many shops. Make them from pieces of pipe of various lengths and diameters. Cut the V's with a hacksaw and finish with a file if desired. Pipe up to 6 in. I.D. has been used for this.

AIR-POWERED DEVICES

INCREASE MACHINE OUTPUT

Opportunities exist in many plants for increasing output of installed machines, and for improving morale at the same time

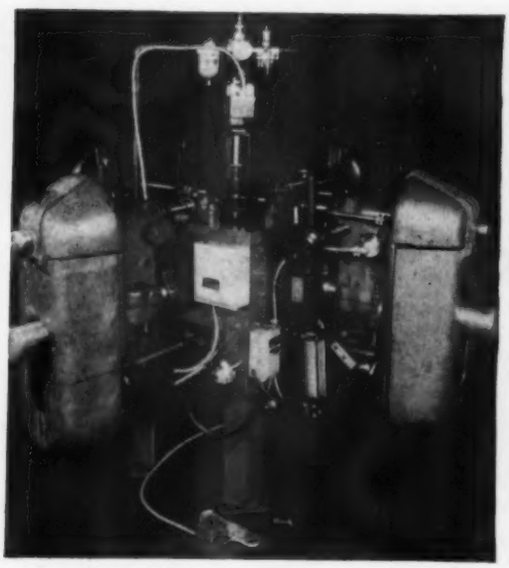
BY RUPERT LE GRAND, ASSOCIATE EDITOR

HIGHER costs are stimulating methods improvements on a broad front. Much work has been done since the war in respect to:

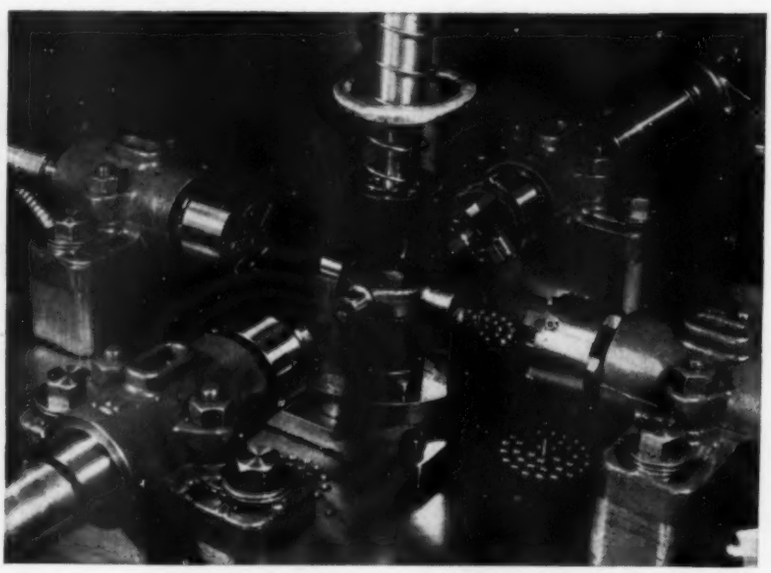
1. Better materials handling.
2. Semi-automatic and automatic work loading.
3. New general-purpose and special-purpose machine tools of greater productivity.
4. Better tools, jigs and fixtures.

All of these are worthy efforts toward reducing costs. But, considering the great mass of ordinary, everyday operations and the equipment installed for them these questions can be asked:

1. Is enough attention being paid to improving the output of existing equipment?
2. What steps are being taken to provide low-cost special-purpose machines (built from commercial units) for operations that do not warrant the expense of specially engineered, high-production equipment?



Air-powered drill feeds combined with commercial drillheads form a multiple-spindle unit



Box tooling produces a better finish, and all four trunnions of the universal forging are machined simultaneously

How an Inexpensive Machine Was Built

WITH AIR FEEDS and clamping devices, it is possible to build inexpensive special-purpose machine tools from commercial drillheads, a machine base and fixture. A Chicago manufacturer did this after experiencing much trouble when turning the trunnions of a universal joint on a lathe. He now gets 60 pcs. per hr. as compared with 8½ pcs. per hr. from the old method.

The whole job is now done at once by box tools on four spindles. Each drillhead is equipped with an air-powered feed and Hydro-Check for smooth cutting at the desired feed.

The operator lays the trunnion on the central fixture. This consists of a serrated member for gripping the body of the universal joint, and four depressible V-blocks which centralize the trunnions.

At proper point in feed, each spindle releases a microswitch in a circuit controlling the air motor powering the vertical clamping ram.

Now, an electric control valve operates an air-operated clamping ram placed over the fixture. When the ram descends, a spring-backed gripping pad comes into contact with the body of the universal joint. Next, a central plunger passes through the workpiece and actuates mechanism that depresses the V-block supports. Now the piece is correctly positioned and firmly grasped by the upper and lower serrated clamps. The box tools do their work, and the automatic sequence control of the machine returns the spindles and the clamping ram.

From scattered instances of cost savings made in these two directions, it is obvious that here are two very fertile fields for improvement in methods in a great number of plants.

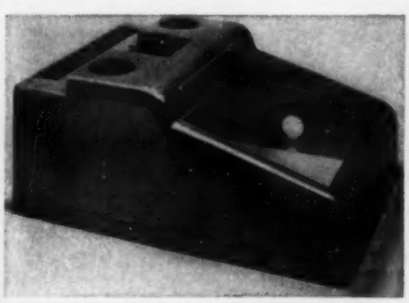
Basically, the problem of identifying possible improvements throughout the shop can be solved by seeking the answers to these questions:

1. What existing machines will turn out more work if power feeds are substituted for manual feeds?
2. What operations will benefit from power clamping as compared with hand clamping?
3. What operations can be speeded up by power feeding, clamping and perhaps ejection?
4. What operations or combinations of operations should be handled by a simple machine built up from commercial drilling and tapping heads plus perhaps electrical sequence control of the heads?

The means for realizing these objectives are commercially available. During the war, the Bellows Company of Akron, Ohio, developed a series of air-powered devices, which are illustrated in connection with a number of various jobs. Further to understand the application and operation of these devices, they are identified as follows:

1. The *air motor* is a pneumatic cylinder provided with speed and directional valves as integral parts. This device is controlled by lever or remote-control air or solenoid valves.
2. The *powered feeds* are powered by an air motor and incorporate mechanism to feed a drilling or tapping spindle or the table of a milling machine or surface grinder. Control can be by hand lever, or remote-control air or solenoid valves.
3. The *Hydro-Check* is an adjustable hydraulic resistance unit, which may be coupled to the power feed to cut in at any point in the power traverse, in order to overcome the inherent "springiness" of air feeding and thus provide steady feed while cutting.

Some of the ways by which these devices can be combined to increase output and to improve labor relations, are illustrated by the following case examples of savings in a variety of plants:



Corners and straight runs complicate this spot-welding job, as far as manual control of the welder is concerned

Spotwelder Control Solved Labor Problem

RAPID LABOR TURNOVER is inescapable on "mankilling" jobs. Production suffers, too. This situation occurred when postwelding the case of a business machine. The assembly was designed for 60 spots. On straight portions of the work, a ½ in. electrode opening sufficed to shift the piece, but at the corners an electrode opening of 2½ in. was needed. As a consequence, the spotwelder operator had to "pump" the pedal through strokes up to 12 in. long.

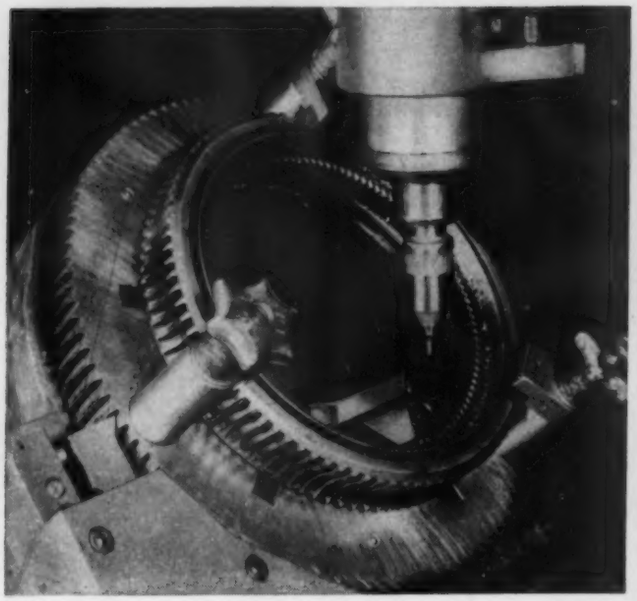
One "victim" on this job wore out a pair of shoes a week, working the pedal first with one foot and then the other. Besides, the engineers had to agree to reducing the spot welds to 40 per case in order to realize a production of 20 spotwelded assemblies per hr.

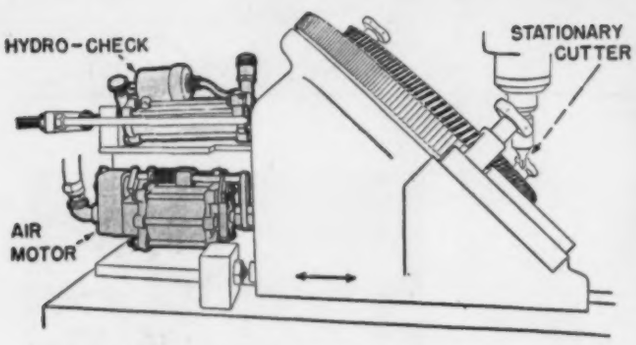
Properly welded assemblies are now produced at a rate of 80 to 100 cases per hour, by relieving the operator of pumping a pedal. He now depresses a foot switch which operates a solenoid. Two lengths of electrode stroke—½ in. and 2½ in. —are obtained by connecting the solenoid to a 3-way block and bleed valve.

When the operator depresses the switch, the valve is opened, causing an air motor to open the electrodes 2½ in. But the solenoid also slides into place an eccentric cam, which trips a poppet valve on the air motor, so that it operates for a ½ in. stroke. When a straight portion is finished and the operator wishes to turn a corner, he releases the foot switch. Now the 3-way air valve is closed, opening the bleed so that the spring attached to the machine's fulcrum will operate the electrodes for full 2½ in. stroke. Operation of the foot switch is repeated until all necessary spot welds are completed. The foot switch has a long cable so that it can be moved to the best position while manipulating the case between the electrodes.

Opportunities also exist to modernize spotwelders by the application of air-powered devices. A Chicago manufacturer installed an air motor to provide sufficient electrode squeeze when spotwelding 20-gage strap stock, and thereby overcame failures of the weld after the product was placed in service. And by providing the machine with a foot switch and welding timer the output of the spotwelder was also increased. *(next page, please)*

Worker dissatisfaction was removed and production increased 400 to 500% by substituting electrically controlled air power for foot power to open the spotwelder electrodes





Combination of a suitable fixture with a power feed enabled one machine tool builder to obtain a six-fold increase in production on chamfering 101 teeth of an internal gear

Air Feed Checked Hydraulically

THE INCLINED face of the fixture locates the gear at the proper angle so the stationary cutter will chamfer the ends of two adjacent teeth. The gear is placed on the locating surface of a ratchet-type index wheel, and the first tooth space is aligned with the cutter by a small triangular locator. Then, the operator tightens three hand clamps and operates a remote control valve connected to the air motor. Cycle details are:

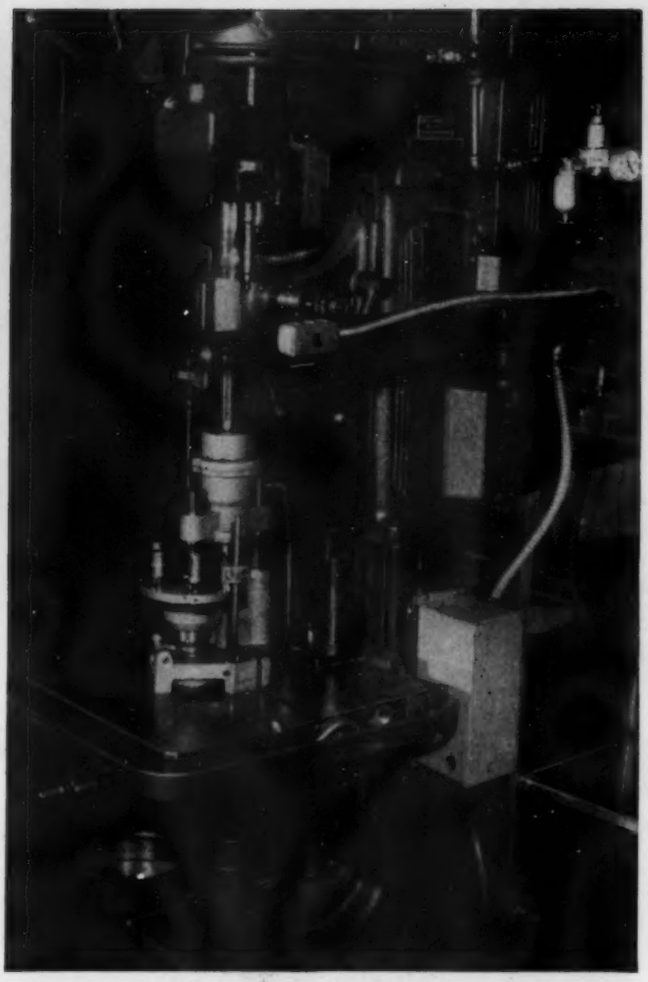
1. The air-motor piston advances the fixture to the cutter, so that two adjacent teeth are chamfered. During the feed stroke, the Hydro-Check controls the feed rate.

2. At the end of the preset stroke, piston travel is reversed automatically, and the fixture indexing pawl is tripped after the cutter has passed back through the work.

3. Feed and return strokes of the fixture and indexing of the workpiece are repeated automatically until all 101 teeth have been chamfered.

Production per machine is 12 gears per hr., and the operator handles five vertical millers equipped in the manner described.

Numerous other examples of how to apply an air motor and a hydraulic cushion could be cited with respect to milling operations.



Power for feeding the multiple-spindle drillhead is supplied by an air-operated drillpress feed, which is steadied by an hydraulic cushion

Pistons for brake cylinders are permanent-molded from an aluminum alloy that has characteristics adversely affecting tool life, particularly if spindle feed is not steady

Serious Fatigue Was Eliminated

TOOL BREAKAGE and fatigue have been substantially reduced by applying an air-operated drillpress feed and hydraulic feed-checking mechanism to a multiple drilling job. The operation is now semi-automatic; output is 784 pcs. per hr. as compared with 408 pcs. for manual operation.

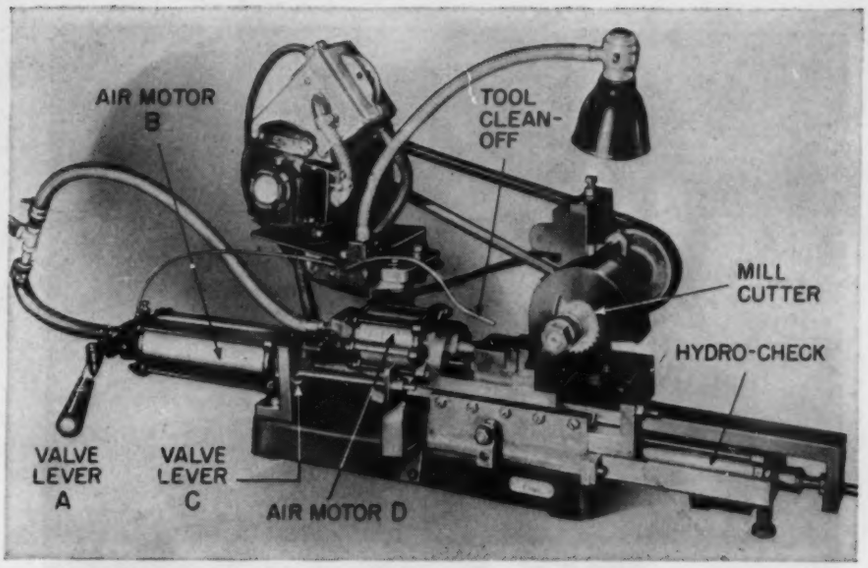
The operation consists of drilling six holes in an aluminum piston for hydraulic brakes. As now performed, the operator loads one station of an indexing fixture and flicks the control handle for the air feed. Spindle return automatically indexes the fixture and ejects the finished part. Fatigue was serious when drilling was performed on a manually fed drillpress.

Air Motors Operate Feed and Clamping

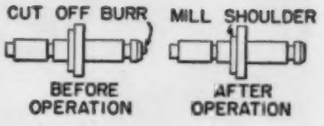
FOR SHORT-RUN JOBS, part cost can often be decreased by building inexpensive special-purpose equipment. A case in point is the $300 unit for deburring the end and milling a flat on a brass dial shaft. Details are:

By tripping valve *A*, air motor *B* starts the table in rapid traverse toward the cutters. At proper point in table travel, a dog on the machine base trips the valve *C*, which operates a second air motor *D*, to clamp the dial shaft in the vise.

Before the work reaches the cutters, a Hydro-Check is tripped, so that table movement thereafter proceeds at preset feed rate. At the end of the cut, the table is reversed automatically. During table return, air motor *D* opens the vise and exhaust air ejects the part into the chute. Similarly, exhaust air from *A* blows chips off the vise.



Brass dial shafts are burred and flat is milled at 7600 pcs. per 8 hr. shift, giving a 31% reduction in cost. Power operation of table traverse and air-operated clamping speeds the work and makes the task more attractive to the operator



She must grasp dual controls

Machine Operator Uses Waiting Time

A "FREE" SECONDARY operation can often be secured by utilizing the operator's waiting time during the cycle of primary equipment. For example, a plastics manufacturer produces an injection-molded plug that requires a punch and trim operation. Formerly, this was done after removal to the finishing room. But by supplying the molding operator with an air-operated press, she is now able to punch and trim the article too and became more valuable to the shop.

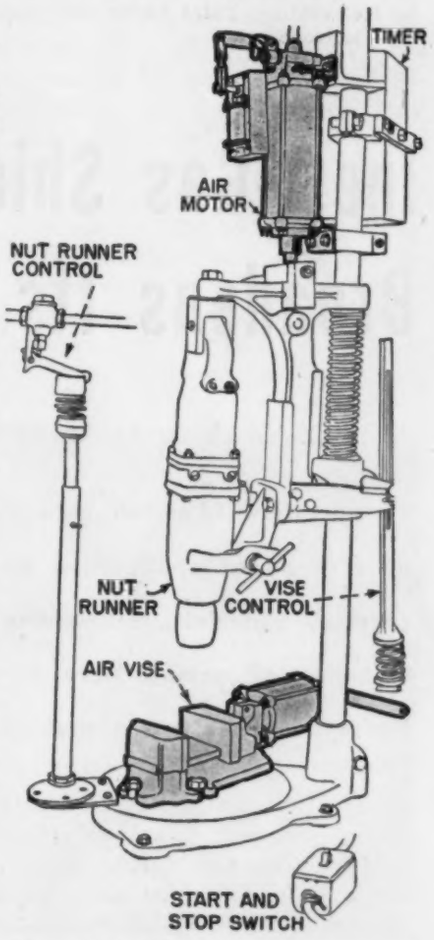
Everyday Jobs Handled Too by Air Power

PORTABLE TOOLS AND DRILLSTANDS can be combined with power feeds and power-operated vises to do innumerable jobs involving nut running and screw driving, in addition to drilling, tapping, reaming, counterboring, etc. These everyday jobs are so common about plants that production increases of 200 to 600% have been obtained by ferreting out applications. Here is a typical case:

A valve manufacturer screwed bonnets onto valves by this sequence of manual operations: (1) place valve in vise, (2) close vise, (3) screw in bonnet by hand, (4) use wrench to tighten bonnet, (5) open vise, and (6) remove valve and place in bin.

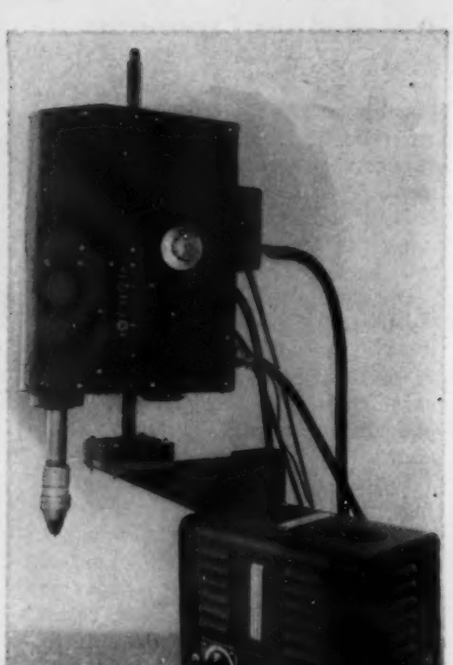
But with the arrangement illustrated, the operator now merely places the valve body in the vise, which opens and closes automatically according to the up and down movement of the continuously cycled nut-runner. The assembled valve falls into a chute and another assembly is started. Important feature of this setup is the automatic timer, which overcomes the effect of threads of variable length. By applying the timer, allowance is made for the maximum length of thread.

Power feeding of drills and reamers often increases production from 40 to 500%, depending on job. In one case, the operator was able to run two machines, and saving an operator.



Manual loading, power feeding and automatic ejection can be arranged for numerous hole-making and assembly operations

Welding section of a tube mill for the production of stainless steel tubing by Heliwelding. Point where weld was interrupted is visible to the left of the electrode



Automatic Heliwelding equipment consists of a welding head which carries the electrode holder and mechanism for constant arc length, and a control box

Inert-Gas Shielded-Arc Welding Broadens Its Applications

BY H. O. JONES and H. A. HUFF, JR. TECHNICAL SALES DIV., AIR REDUCTION SALES CO., NEW YORK

For hard-to-weld metals, as well as for special applications on ordinary materials, Heliwelding is highly efficacious. Here are latest advances in the process

RISING from comparative obscurity to occupy a prominent place in the welding field during the war, the inert-gas-shielded arcwelding process, Heliwelding, is continuing to attract attention for many industrial applications. By solving certain problems, it has greatly increased the scope of welding as a practical means of joining metals, and has made possible the welding of some materials that could not be welded satisfactorily by other methods.

In some cases it has replaced other welding methods where it has been found capable of lowering costs or producing superior results, but it must be recognized that Heliwelding is not a cure-all. It is a welding process which must be judged on its merits along with other welding processes on the basis of job requirements.

Fundamentals of Heliwelding are simple. The source of welding heat is an arc between a nonconsuming electrode and the work. The arc, electrode, and weld metal are shielded from atmospheric or other attack by an envelope of completely inert gas—helium or argon.

One of the key features is the extraordinary suitability of the process to the hard-to-weld metals —those which oxidize so readily and present such persistent oxides that they require fluxes for joining by the more common methods. Aluminum, magnesium, and stainless steels are the more prominent materials in this category; others are presented in Table 1. These are virtually all quality metals, higher in cost as raw materials and higher in selling price as fin-

TABLE 1.

Metals Weldable With Inert Gas Shielded Arc (Heliweld) Process

Metal	Current and Shielding Gas	Remarks
ALUMINUM & ALLOYS		
2S, 3S	ac, argon or dc(r) and Helium (He. should be of higher purity than present (1947) Bur. Mines grade.)	Metal returns to the "0" temper.
52S		Metal returns to the "0" temper. Somewhat crack-sensitive.
53S, 61S		Returns to "0" temper but regains strength upon heat treatment.
17S, 24S, 75S		Objectionable reduction in corrosion resistance severely limits application
BRASS (70-30)	dc(s) and Helium	Loses work-hardened physicals at weld.
COPPER (Deoxidized)	dc(s) and Helium	Loses work-hardened physicals at weld.
EVERDUR	dc(s) and Helium	
INCONEL	dc(s) and Helium	
KILLED LOW CARBON STEEL	dc(s) and Helium	
MAGNESIUM (All commercial alloys)	dc(r) and Helium or ac & argon	Special considerations required with these alloys which tend to be hot-short.
MONEL	dc(s) and Helium	
SILICON STEELS	dc(s) and Helium	Loses work-hardening physicals at weld.
SILVER	dc(s) and Helium	
STAINLESS STEEL		
300 Series	dc(s) and Helium	Readily welded with very good results.
400 Series	dc(s) and Helium	Weldable, but with special considerations.

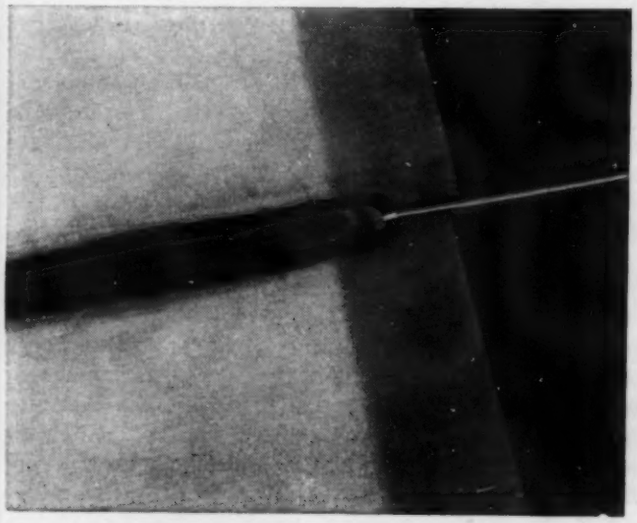
(r—reverse polarity, s—straight polarity)

ished products. As in other finishing processes, they demand quality results in welding.

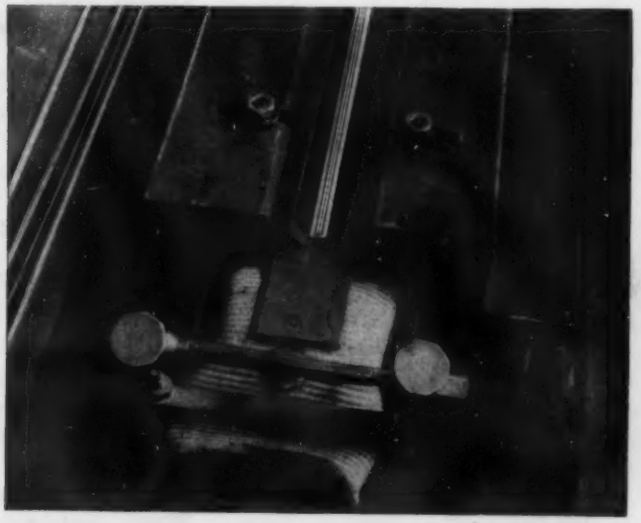
For such materials, Heliwelding offers the particular advantage that with the elimination of fluxes there is no risk of flux inclusions in the weld; no chance of incomplete fluxing action, leading to a weakened joint; and no possibility of incomplete flux cleaning causing loss of corrosion resistance. Slag coatings from electrode flux are non-existant, hence the danger of slag inclusions in the weld is eliminated, as also is the need for slag removal after welding. Welds show excellent metallurgical properties, and are smooth and good-appearing, so finishing operations are minimized. Joints usually require little or no reinforcement.

The intense heat available makes possible a high operating speed, and this, combined with the high rate of heat input, sharply reduces the chances of distortion and other undesirable heat effects. The welding heat is used very efficiently, since it is not given time to diffuse into the metal. The entire process is highly flexible, and welding procedures may be varied over a wide range, under close control to meet special job requirements.

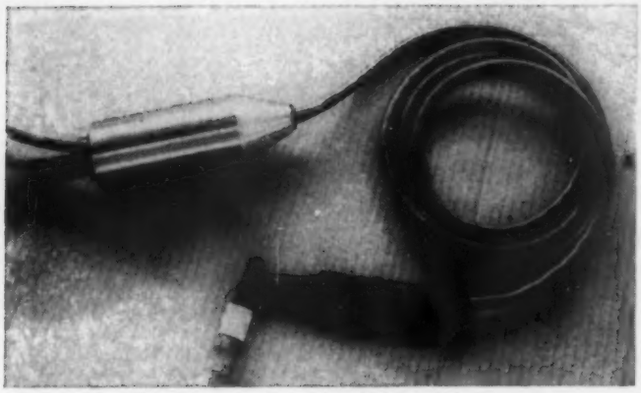
To make full use of its capabilities, the process must be soundly engineered as to suitability for the job, selection of equipment, and operating procedures best adapted for job, equipment, and desired results. Determination of operating procedures means, first, a sound determination of the results desired. Procedures will usually be most critical where an extremely high standard of quality must be met with the as-welded material. When the joint is to be reprocessed by rolling or other operations, speed may be more important than the as-welded quality. The pace of shop operations will enter into this aspect of the application, as also will the cost and extent of previously completed work. For example, on a low-cost material a more critical balance of procedures can be used (which increases the risk of



Manual weld in stainless steel, made with a preplaced strip of parent metal as filler. Strip is slightly wider than the thickness of the stock and is set on edge in the joint before the welding operation is started



Filler metal obtained by flanging up abutting edges. One or both edges may be flanged, depending on the requirements of the work. Pneumatic jig shown gives positive, even clamping, and is quick acting for loading



Manual equipment is designed for ease of manipulation, portability, and durable, safe construction. A light, flexible cable carries gas, cooling water and current between connector block and holder. Unit is light in weight and insulated for welding and high-frequency arc-stabilizing current

TABLE 2

Electrode Current Carrying Capacities: Maximum Currents

Tungsten Diameter in.	In Helium, dc Reverse Polarity (amp.)	In Helium, dc Straight Polarity (amp.)	In Argon, ac (amp.)
0.040	—	50	—
1/16	20	125	80
3/32	45	225	150
1/8	60	300	225
3/16	90	400	350

rejects), for the sake of higher production, than would be economically feasible on an expensive material welded at a late stage of fabrication.

In many cases production welding procedures can be determined only by trial-and-error methods, but the suitability of the process for a given material and type of joint, and the type of equipment to be used, can be largely determined by known factors. An understanding of the nature of the process, and a knowledge of the general requirements for its success, are the bases for efficient applications.

Material, Fitup, and Jigging

In most cases, the materials shown in Table 1 are used in light thicknesses, and because of the intense, concentrated heat, resulting in high available speeds, Heliwelding is well suited to this work. When thicknesses go beyond the limits of a single-pass weld, multiple-pass welding can be used, but in many cases such heavier material can be handled more efficiently by other welding processes. The intermediate range of thickness — above 0.08 in. — for square butt joints in stainless, for example, are usually handled by the addition of filler metal, which is also required in nearly all aluminum and magnesium work. In manual operations, filler metal additions present no problem, but for mechanized welding the filler must be provided either by a feeder device or by preplacement.

Fitup and jigging are vital aspects of most production jobs. Preparation of the material requires care that the edges fit up flush and even and are free of distortion. In cases where forming is involved (as in cylinder fabrication) the shape should conform to a close tolerance. Such care in fitup can do much to reduce the amount of jigging required, but even the best fitup will seldom eliminate jigs entirely. To maintain fitup and reduce distortion, the jig must be accurate and positive. For production economy, it should also be quick acting, easy to load and unload, and, of course, built at a cost in line with the job.

As a rule Heliwelding uses a small-diameter electrode, 1/8-in. or under, so this does not have to get far out of alignment to spoil the weld. It also uses a very short arc, and changes in arc length show up seriously in penetration obtained. It is, therefore, of the utmost importance to maintain arc length and electrode position over the seam within close limits by accurate fitup and jigging.

Types of Equipment

Two of the three basic types of equipment have been designed to minimize the problem of maintaining electrode relationship to the joint. These are the machine type electrode holder, and the electronically controlled Heliweld head. While such equipment serves to reduce the human variables to a minimum, the manual type of holder, like that used for metallic arc-welding, is still the most flexible and versatile means of handling many jobs. Basic considerations will usually determine the type of equipment to use.

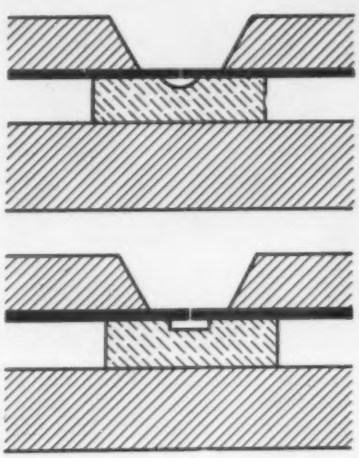
Manual welding serves best for tacking, irregular contours, fillet welds, vertical and overhead work, short joints, joints requiring heavy filler metal additions repair of casting defects, and other similar jobs where either the flexibility of manual work is desirable, or the joint is unsuited to mechanized work.

Machine welding is recommended for repetitive runs of regular-contour joints, where joint preparation and jigging assure constant results, and where economic factors justify a relatively large investment in jigs and equipment, i.e., mass-production work.

Automatic methods (electronic arc-length-controlled) are indicated for mass-production work, as on a tube mill, where repetitive or continuous welding cannot be economically jigged with sufficient accuracy; where speed is important; and where production requirements justify rather expensive equipment.

Each of these methods provides merely a different means of striking and holding the arc over the joint. This is the focal factor in Heliwelding, but supplementary equipment is needed for efficient operation. This includes a suitable welding power source, either a standard dc. welding generator or an ac. transformer; a suitable source of shielding gas, helium or argon, of satisfactory purity for the operation; and a flowmeter either incorporated in the regulator

Test piece indicates the extent to which a piece of Heliwelded stainless steel tubing can be deformed without rupture of the weld



Backup supports, showing types of grooves used on very thin material. Supports may be used for support only, to dissipate heat more rapidly, to further shield the back of the weld, or to regulate the amount of reinforcement on the back

Ceramic gas cap at the top of the holder provides effective shielding gas flow around the weld area. It is long lived and may be reground when the end roughens with use

or installed separately, as may be convenient, to insure regularly reproducible shielding-gas flows.

Additional apparatus will vary from job to job, and almost every installation must be assembled to meet individual requirements. This does not mean that an elaborate installation is necessary, although it will often prove advisable to plan beyond immediate needs to provide a flexible and efficient setup for future expansion.

Welding Procedures

The generally recommended types of welding current and shielding gas for the most commonly Heliwelded metals are shown in Table I. Argon and ac. is the first choice combination for aluminum, and second choice for magnesium; helium and reversed-polarity dc. is first choice for magnesium and second choice for aluminum; with helium and straight polarity dc. for all other metals on the list.

There are, however, exceptions to these general rules. Argon, used with a carbon electrode, may be preferable for manual welding of light stainless steel, and argon also appears to be advantageous in welding silver with a tungsten electrode.

The other important variables are the shielding gas flow, welding current value, and welding speed. The flow of gas (number of cubic feet per hour used) is critical. It will generally run to 12-20 cu. ft. per hr., but the actual flow will have to be determined by trial and error. The goal is to determine, within practical limits, the minimum gas flow, for cost reasons, which will give adequate shielding gas coverage to produce quality welds. If the equipment is suitably designed, with correct orifices and gas cap, good coverage can be obtained at an economically satisfactory flow, but a drafty shop, for example, can make an appreciable difference in gas consumption.

The welding current value (amperes) and welding speed are closely interrelated. The speed desired will affect the current value —the higher the speed, the more required for a given penetration. Current value, in turn, affects the size of electrode used. Each size has an optimum current capacity which is at or near the maximum capacity given in Table II, and it is desirable to use a current value as close to this figure as possible. Therefore, the electrode size should be chosen to meet the current value required for the speed sought.

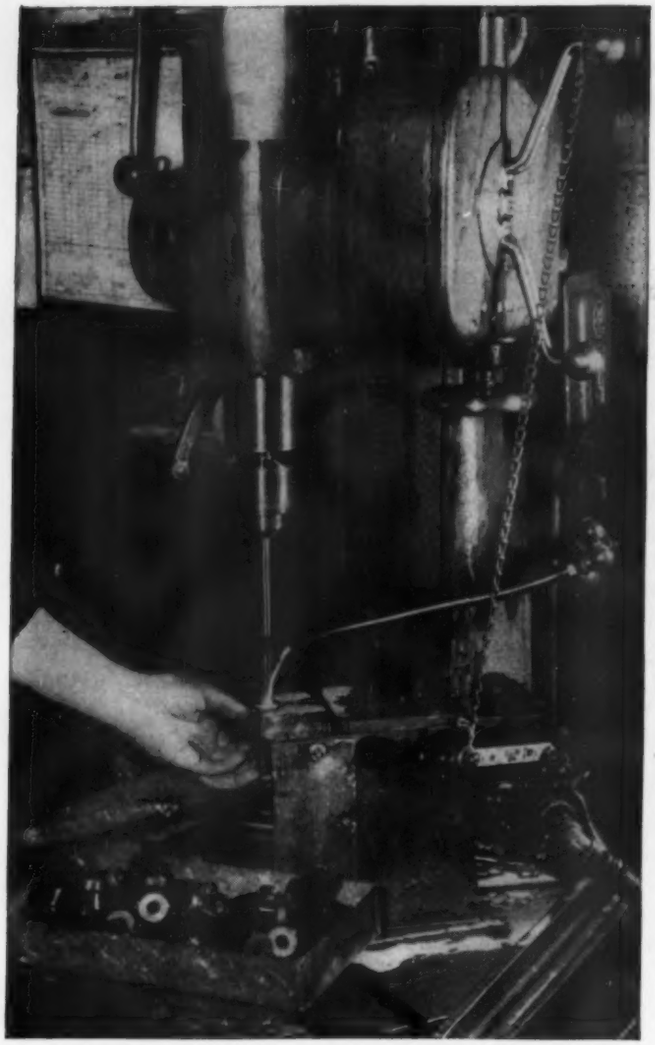
Welding Speed

While extreme speeds are possible, the whole operation becomes rapidly more critical as the higher range of speed is reached, so peak speed tends to sacrifice quality. At the same time, welding efficiency drops sharply at very low speeds, as considerable heat can diffuse into the work to no purpose. Moderation, except under unusual production requirements and conditions, will usually be the most satisfactory basis for speed determination, or at least, should be the starting point for working toward the best pace for the job.

While many case histories of inert-gas-shielded arcwelding have been reported during the past eight years, most were emergency war uses, developed within the severe limitations of earlier and less capable equipment than is now available. Where the wartime air-cooled manual holders had current capacities of about 125 amp. max., the postwar water-cooled manual and machine holders have been used successfully at better than their rated capacities of 300 amp. The thicknesses and speeds obtainable with such improved equipment have already opened great new fields for the process, but research is under way to improve its capacities still further. Some of the outstanding new applications include the continuous welding of stainless steel tubing, and the production welding of elliptical, aluminum, wing droptanks for aircraft, using filler metal, in quick-acting jigs which permit excellent speeds for such operations. Truck-trailer bodies, railroad cars, kitchen and restaurant equipment, among others, are routine operations for the postwar Heliwelding process, and where properly engineered to the job, it is a proved success.

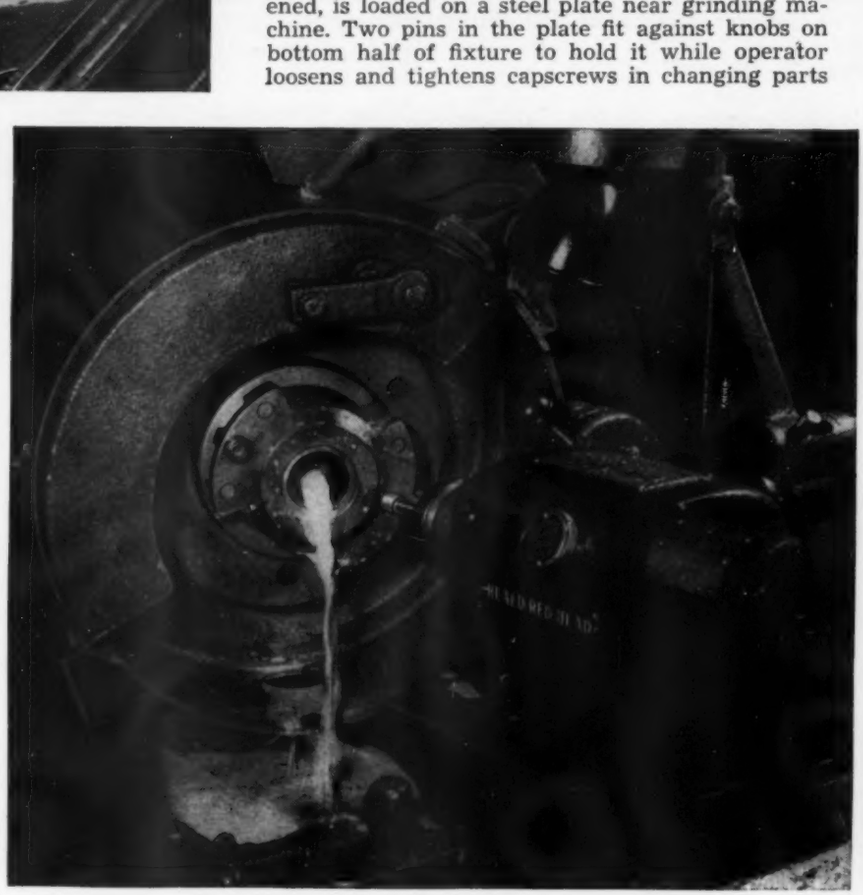
SHOP SHOTS

AT LORD MFG. CO.



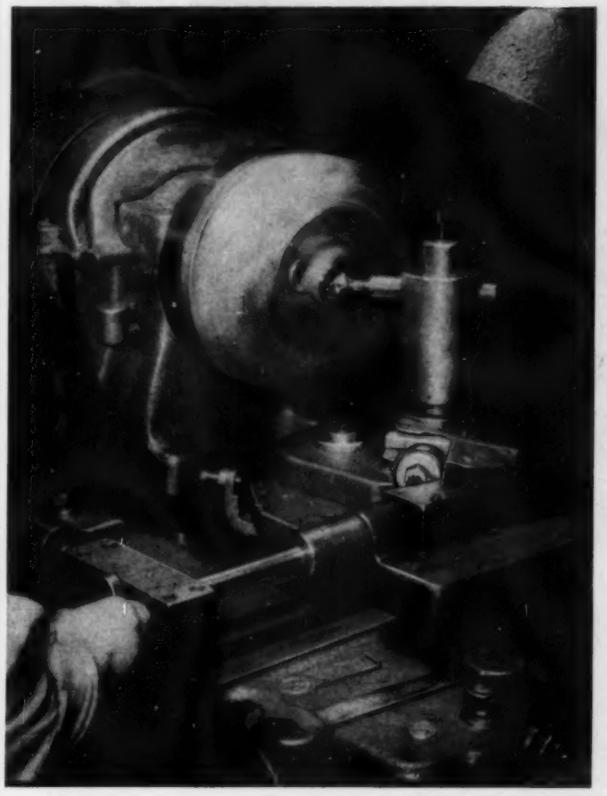
Machining time was cut in half and greater accuracy obtained in reaming ⅝-in. couplings by fitting drillpresses with air-chucking fixtures. Air switch closes vise and engages drill at the same time. Releasing air switch opens the vise, dropping the part into a chute, while a spring automatically returns the drill

Aircraft-mounting fixture, consisting of two halves that compress part when two cap screws are tightened, is loaded on a steel plate near grinding machine. Two pins in the plate fit against knobs on bottom half of fixture to hold it while operator loosens and tightens capscrews in changing parts



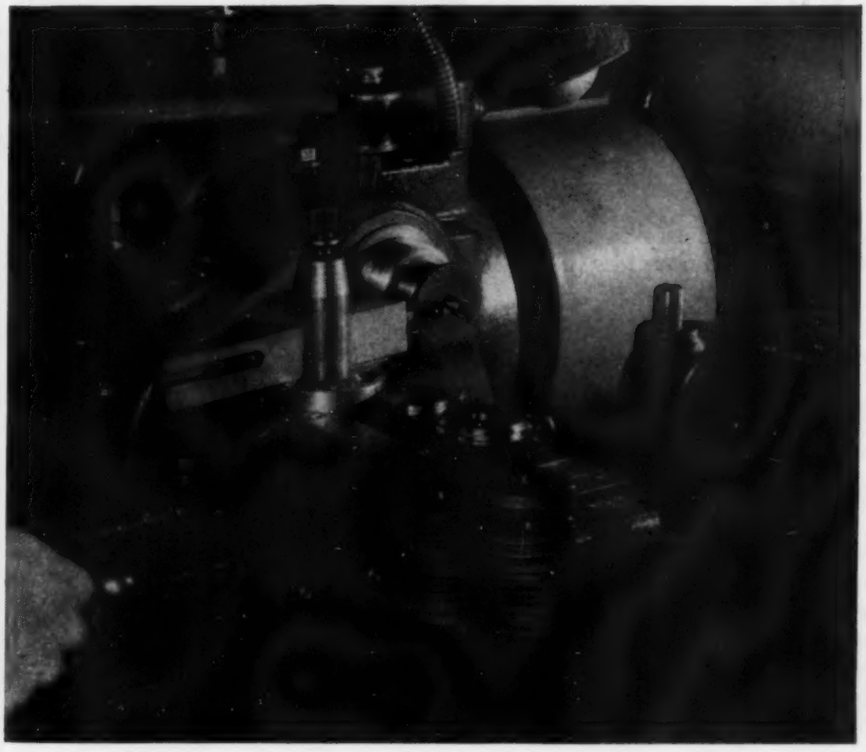
Internal grinding of end-plate tapered hole in aircraft mounting of two steel end plates and core, bonded to rubber throughout, is done at 35° and 0.005-in. depth tolerance. Fixture held in pot chuck must compress mounting to insure proper alignment of taper bore, final assembly being done under hydraulic pressure. Use of two shuttle fixtures allows loading of one while other is on machine, as at upper right

BY WALTER RUDOLPH, ERIE, PA.

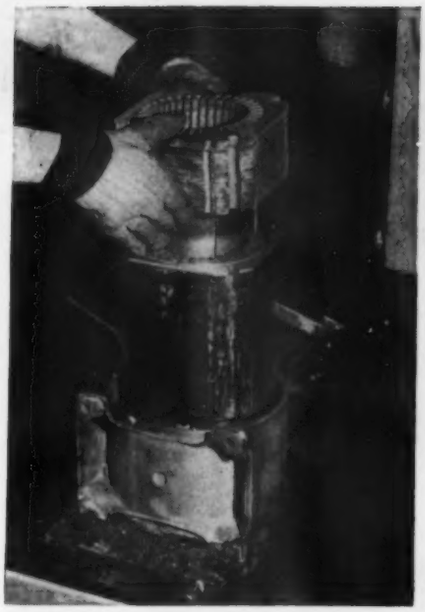


Wing-bracket part of Lord Dynafocal aircraft mounting requires 0.0014-in. tolerance on dia. of spherical seat to fit compo ball of oil-retaining bronze. A radius attachment replacing the cross-slide is operated manually by crank and worm gearing to rough out the pieces. Carbide tool is then changed to obtain extra fine finish on the seat

Special chuck holds the Dynafocal part, a plug being used to align the bored hole. Position of tool post is adjusted by micrometer held in a bracket. In changing tools, the exact position of tip is determined by micrometer and the new tip is brought to that same micrometer reading to insure trueness of sphere



Precision chamfering to 45° by ⅛ in. of SAE X4130, half-hard temper washers of 1.990-in. O.D. was speeded up by use of arbor screwed on the lathe drawbar. The washer, slipped over the arbor, is held against a tapered flange by a slotted washer and an end capscrew when the drawbar is tightened



1 **Fixture** on lower, upward-acting press ram locates welded frame as core end plate and previously counted lamination stack is set on mandrel

2 **Core assembly** is squeezed by 30-ton pressure while four locking bars are driven into corner slots. Relieved top ram clears bar ends

TRIPLE-ACTING PRESS ASSEMBLES STATORS

BY H. H. GEIMEIER, Staff Supervisor, Mfg. Engrg.,
BUFFALO DIVISIONS, WESTINGHOUSE ELECTRIC CORPORATION

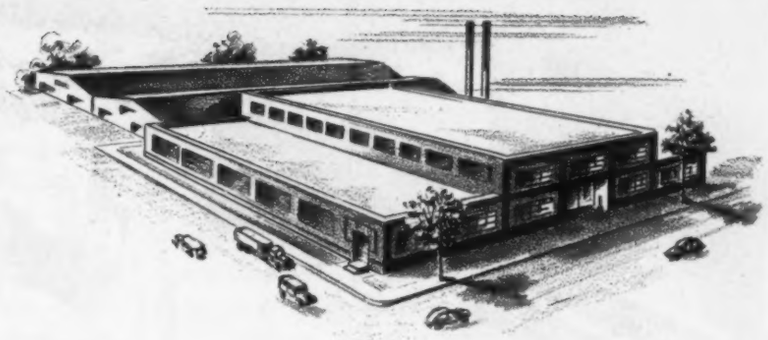
A SPECIAL Watson-Stillman triple-action hydraulic press assembles Westinghouse Life-Line ac. induction-motor stators in one articulated movement.

The motor frame is first dropped over the press arbor and falls below the mandrel. A heavy end plate, located by lock-bar slots, the core laminations, located by a pin through one of the coil slots, and the final end plate are dropped in turn over the expanding mandrel which is operated by a small cylinder inside the press center plug.

Core and end plates are locked by the expanding mandrel and pressed together by the 30-ton top ram while four locking bars are driven into their corner slots. Before the pressure is released, the lower ram moves up to force the motor frame over the assembly, after which the stator is conveyed away to be tackwelded.

Several of these presses, each using similar assembling cycles, are used for the different sizes of motors. Slight changes in press-action limits make it possible to produce many lengths of the same size core on one press.

3 **Gage** held on frame by operator contacts limit switch to release hydraulic pressure after ram has moved up to force frame over core



BY BURNHAM FINNEY
EDITOR

How to Keep Your Employees Informed

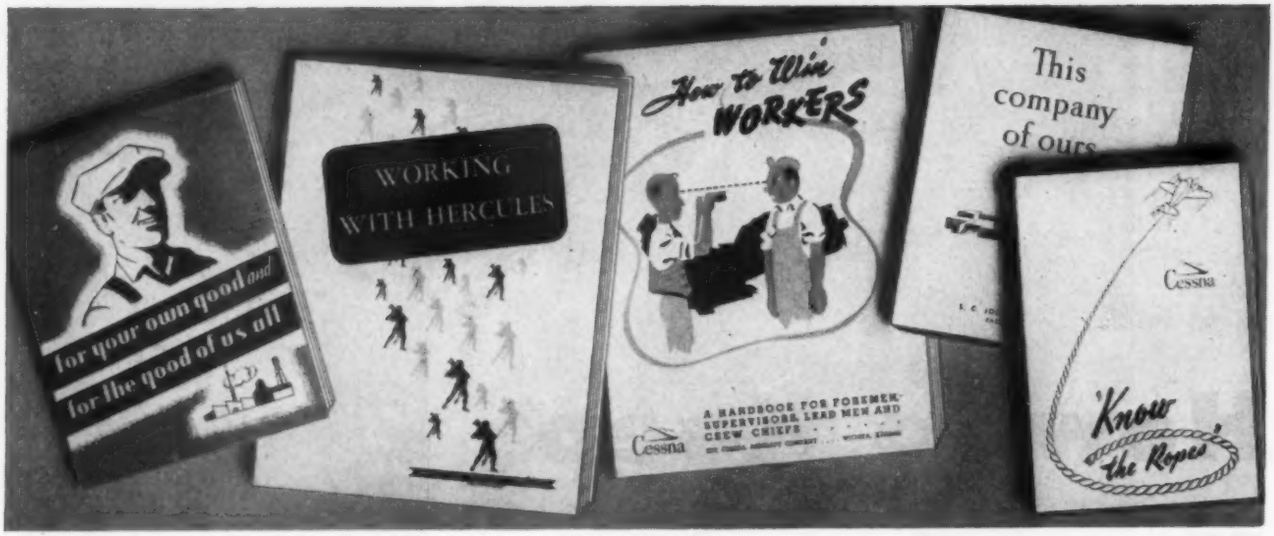
Management is more keenly aware than ever before that good relations with employees depend upon keeping them posted on the company's entire operations. Suspicion and distrust breed upon lack of information and upon misinformation. This special report outlines how management is telling its story to its workers — in handbooks, annual reports, mass meetings, open houses, bulletin boards, plant newspapers and magazines, and letters direct to their homes.

THERE is greater need today than ever before for management to keep its workers informed of what it is doing. Old-time secrecy is rapidly giving way to frank dealing. Manufacturers are telling their people far more than they used to about all phases of their business, from conditions of employment to profits.

One doesn't have to look far for an explanation of this change of heart. The worker is having the economic facts of life presented to him regularly and assiduously by two very active sources: his government and his union, if he has one. These facts, often luridly colored by prejudice in the case of unions, are tossed at him through newspapers, magazines, radio, political and union meetings, word-of-mouth and propagandist literature.

Recent polls reveal disturbing conclusions about the worker's thinking. When asked to vote "yes" or "no" on the desirability of each of the main features of the Taft-Hartley Law, divorced from the law itself, he overwhelmingly approved them. Yet he expressed disapproval of the law in an out-and-out vote on it. He has a lingering suspicion, hard to dislodge, that the published reports of his company's profits do not tell the whole story. The profits *must* be bigger than indicated. He understands little or nothing about many of his company's policies, such as auditing practices, setting aside of reserves and amortization of debts.

It is time for management to speak up and take him into its confidence. After all, he has a stake in the business, too. If management wants from him the cooperation which it professes to desire, he should be kept informed of its affairs. The truth is that alert manufacturers are doing this


for your own good and for the good of us all
WORKING WITH HERCULES
How to Win WORKERS
A HANDBOOK FOR FOREMEN, SUPERVISORS, LEAD MEN AND CREW CHIEFS
Cessna
This company of ours
Cessna
'Know the Ropes'

SMART APPEARANCE *is one of the features of company manuals or handbooks issued to employees. Instead of laying down rules arbitrarily, they are written in a friendly, informal manner, are well illustrated with cartoons and pictures*

very thing. They realize that workers in general are fair-minded and want to do what is right. They cannot know what is right, however, unless they possess all the evidence. It is management's job to furnish them with it.

It is possible to present the evidence only if the lines of communication between the front office and the men in the shop are well established and are used properly. It is management's responsibility to see that the facts are transmitted free from propaganda. The first step is to win the confidence of employees by a sincere, free-from-bias statement of the facts. There should be no "tongue-in-cheek" approach. Management should not try to pontificate.

"In the final analysis, everything depends on the spirit with which management attempts to share information with employees," states Keith Powlison, vice president of the Armstrong Cork Co. in the "Harvard Business Review." He continues, "It should be clear that the facts of business, and of profits in particular, cannot be shared with employees unless there is understanding and confidence between employers and employees and the communication lines between them are kept open."

Management should find out what workers want to know and give them a frank answer. No good purpose is served if the employer tells the facts about a half-dozen things which the worker is mildly interested in and sidesteps an answer to the hot problem which is burning him up. Not that management has an obligation to answer every question, no matter how intimate. But it does have an obligation to tell candidly why it cannot. And its answer had better be good!

Management has access to many lines of communication with its people. It can use information manuals of various kinds, plant news-

TOPICS COVERED IN COMPANY HANDBOOKS (130 Companies)

	COMPANIES		COMPANIES		COMPANIES
Group insurance	99	Absences	75	Wage policies	60
Safety	95	Hospital insurance	72	Bulletin boards	57
Paid vacations	94	Suggestion system	72	Eating facilities	56
History of company	93	Use of telephone	67	Hiring policies	55
Hours of work	88	Holidays	65	Solicitations	52
Promotion opportunities	83	Time clock & sheet	65	President's message	50
Recreation	80	Employee magazines	64	First-aid policy	50
Pay period	75	Smoking	60	Lateness	50

SOURCE: Policyholders' Service Bureau, Metropolitan Life Insurance Co.

papers and magazines, direct mail, factory, bulletin boards, pay envelope inserts, plant public address systems, mass meetings, "open-houses," annual reports and the medium of its supervisors to get its messages to its employees. The remainder of this article will be devoted to a discussion of these means of communication.

It long has been the practice of manufacturers to publish information manuals or handbooks. Some are aimed solely at new employees. But others are designed to give workers the facts about specialized subjects, such as group insurance plans, profit-sharing programs, or suggestion systems. Manuals sometimes are intended for special groups of employees. It was common during the war for companies to issue manuals for women workers as the number of feminine employees grew.

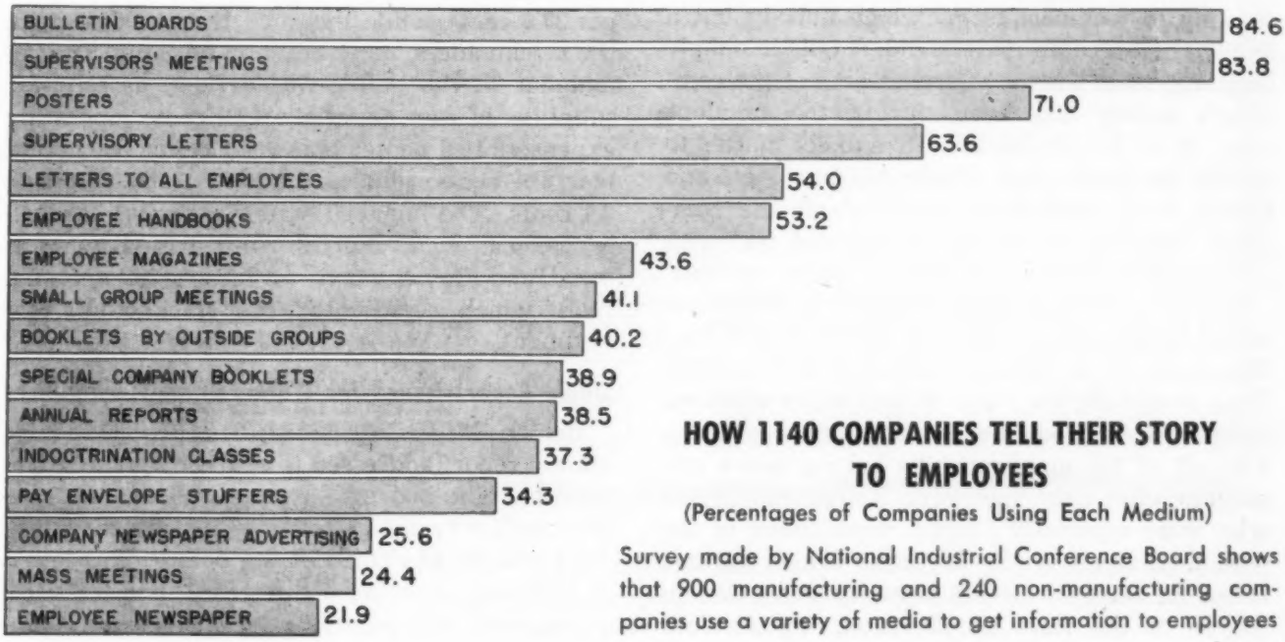
The first factor to consider in preparing a manual is the particular group to be reached. Is it for all employees? Is it for new employees only? Is it for one of the company's plants as set apart from others? Is it for a special group, such as war veterans? Separate manuals often are published for shop workers and for office employees. A manual going mostly to men with families will differ in its language, and perhaps its general approach, from one for women employees.

It used to be that employees' manuals were stiff and formal, in many instances. They listed "dos" and "don'ts" in no uncertain terms. They laid down the rules arbitrarily. That kind of harsh technique has been discarded in favor of a friendly, informal approach. The advantages of working for the company and the mutual stake of employee and employer in the success of the business are stressed. An attractive cover with a good photograph or drawing is used, preferably in color. The title in numerous cases is informal. Some samples: "Introducing Your Company" (Continental Screw Co.); "Life at Frigidaire"; "Your Life in Blackhawk-town" (Blackhawk Mfg. Co.); "Your Job With Farrell-Birmingham"; "Partners in Revere" (Revere Copper & Brass, Inc.); and "About You . . . And Us" (Munsingwear, Inc.).

Typical of the attractive handbooks now being issued by management is the one for employees of the Tapco plant (Euclid, Ohio) of Thompson Products, Inc. It consists of 143 pages in two colors, liberally illustrated with photographs and cartoons. It is 4⅜ x 6⅝ in. in size. There is scarcely a subject which it does not cover; it contains a six-page index. At the front is a friendly word of greeting from Frederick C. Crawford, president.

Practice Growing of Publishing Annual Report

Employee manuals vary widely in size and in kind of printing (most are printed by letterpress, however). There is no set rule as to the department responsible for their preparation. The advertising, public relations and industrial relations departments each has been charged with the job, depending upon the company involved. In 26 out of 38 companies reporting in a survey made by the Policyholders Service Bureau of the Metropolitan Life Insurance Co., the personnel department had a hand. This survey found that manuals are a cooperative affair in many companies. At Whitman & Barnes Division of United



HOW 1140 COMPANIES TELL THEIR STORY TO EMPLOYEES

(Percentages of Companies Using Each Medium)

Survey made by National Industrial Conference Board shows that 900 manufacturing and 240 non-manufacturing companies use a variety of media to get information to employees

CARTOONS *drawn by one of its employees are a main feature of a new type of annual financial report published by ATF, Inc. Sixteen of the 20 pages are devoted to cartoon presentations of topics about which employees said that they would like the management to tell them*

Drill & Tool Corp., the foremen and supervisors had a large part in preparing contents of the handbook and in approving the completed form.

The practice is growing of publishing an annual report of company operations for employees. In some cases, management combines the report to stockholders and to workers in one report. No publication issued by management is more important than this periodic report to workers. For, above everything else, workers today keep their eye on company profits and they want to be sure that they are getting their full share of wages and that management is not profiting at their expense.

Whether this report assumes the form of a special report for workers only, or whether it goes jointly to employees and stockholders, it is being humanized more year by year. Instead of sticking to technical terms which nobody but a financial man could understand, it tells in simple language what the outgo and income of the company's money has been during the previous year. It no longer confines its subject matter to profits and losses, but interlards these facts and figures with interesting things about the company. The report usually is "dressed up" with pictures and drawings to make it more readable.

The trend toward popular reports is well illustrated by the annual financial report of ATF Inc., Elizabeth, N. J., parent company of American Type Founders, Inc., and of five other affiliated companies. It consists of 20 pages put together as a result of the management's having asked employees what they wanted to know. Employees who were especially helpful were listed in the report. Sixteen of the 20 pages are in cartoon form, the cartoons having been drawn by an employee of the Hart Co. Division. Of the four other pages, one listed "what we took in and how it was spent during the year," another was headed "how we stood financially on March 31" (end of the fiscal year), a third was devoted to a company organization chart, and a fourth to suggestion credits.

Benefits were emphasized from constant teamwork by employees, stockholders, officers and customers. The report stressed that of each dollar ATF received during the year, employees got 37.6 cents, while the more than 5400 owners, the stockholders, received only 1.1 cents. The remainder of the dollar was divided as follows: suppliers of raw materials, 40.2 cents; operating expenses, 10.8 cents; taxes, 4.3 cents; wear and tear, 2.4 cents; officers, 1.2 cents; and reserves, 2.4 cents. The financial statement was in "primer" terms: what the company owned, what it owed, and the net worth (difference between the two) which represented the stockholders' investment.

Single Report Issued for Workers and Stockholders

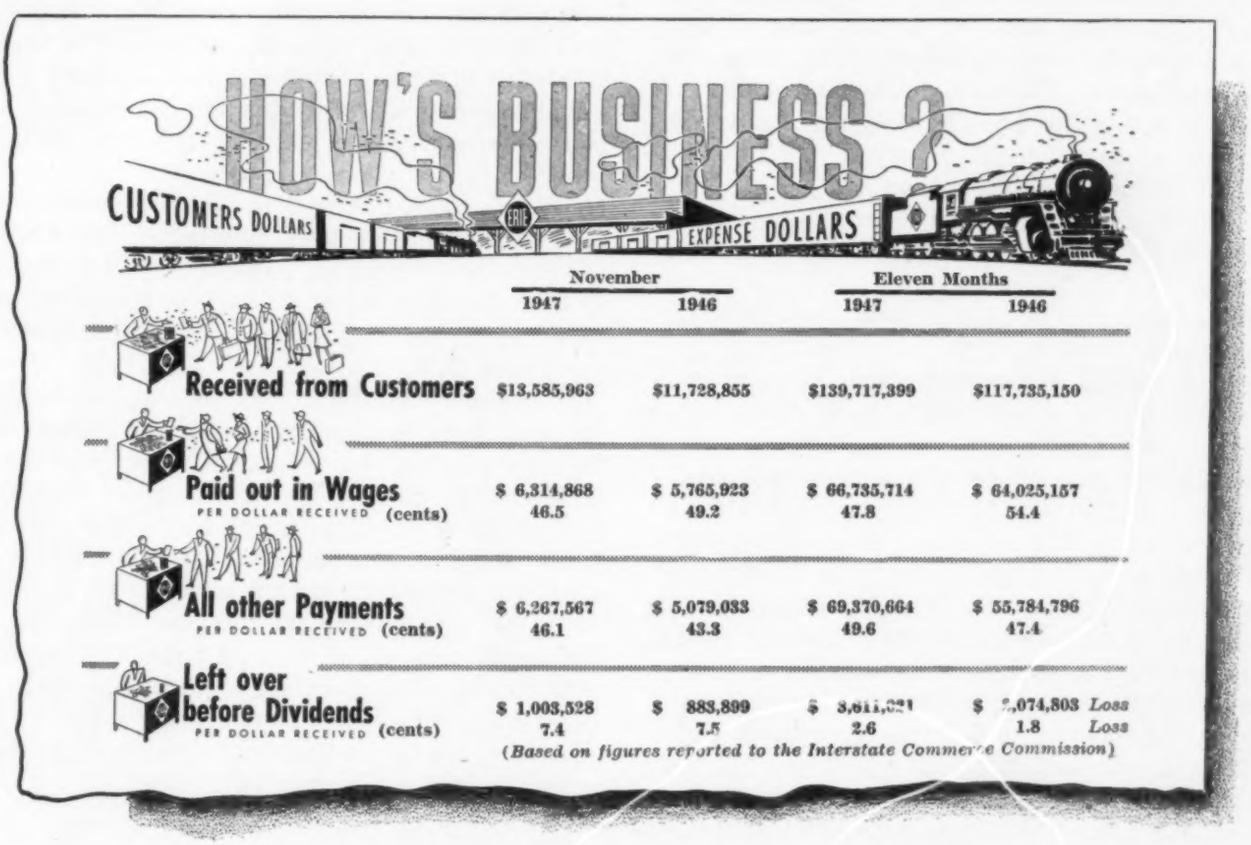
Belden Mfg. Co., Chicago, issues a 16-page annual report addressed to shareholders and employees. The last available report, for 1946, begins with a two-page letter signed by the president and the chairman of the board. This letter, in addition to giving a condensed, non-technical comparison of operations for the current year

with the previous year, comments on the company's balance sheet, plant expansion and the business situation. It is frankness itself in describing executive compensation.

Employees were asked to read particularly pages 10, 11 and 15. On pages 10 and 11 were "important assets not listed in the balance sheet of your company." One of these assets was "sustained productivity." The management noted proudly the fact that with no change in plant area, the same number of machines and almost the identical number of operators, the gross weight of shipments from the Chicago plant increased 5.1% in 1946 over 1941. Another asset was "team spirit." Four examples of this spirit were outlined, one being how a home of an employee was saved by a loan of only $110 by the Belden Credit Union.

Allegheny Ludlum Steel Corp., Pittsburgh, published for its employees and neighbors in its four plant cities an eight-page report in 1947. It opened the report with a candor which was disarming, "You, as an employee or neighbor are important to us, just as we are important to you and the welfare of the community. We always have believed in doing as much business locally as possible from a standpoint of labor and supplies. Therefore the better we understand each other, the better our business relations will be." The company then pointed out that it is the largest private employer in the community, the largest consumer of water, gas and electricity ("which has a favorable effect on your rates"), the largest taxpayer ("easing your load to a marked degree"). Hence the company felt that the facts in the report were of considerable interest.

The report stressed several key facts: Allegheny Ludlum workers have careers, not just jobs—51% have been with the company over 10 years. The company provides a safe place in which to work; the safety record in each of its mills is far better than the average for the steel industry; this higher income is directly reflected industry as a whole. It pays good wages—16 cents per hour more than the average in the steel industry; this higher income is directly reflected in larger purchasing power per wage earner in the community. The company makes a fair profit; it has more shareholders than employees, and it depends upon investors' capital for its tools and its ability to modernize, expand and create more jobs and easier work. The report listed profits in easy-to-understand terms.



	November 1947	November 1946	Eleven Months 1947	Eleven Months 1946
Received from Customers	$13,585,963	$11,728,855	$139,717,399	$117,735,150
Paid out in Wages	$ 6,314,868	$ 5,765,923	$ 66,735,714	$ 64,025,157
PER DOLLAR RECEIVED (cents)	46.5	49.2	47.8	54.4
All other Payments	$ 6,267,567	$ 5,079,033	$ 69,370,664	$ 55,784,796
PER DOLLAR RECEIVED (cents)	46.1	43.3	49.6	47.4
Left over before Dividends	$ 1,003,528	$ 883,899	$ 3,611,021	$ 2,074,803 Loss
PER DOLLAR RECEIVED (cents)	7.4	7.5	2.6	1.8 Loss

(Based on figures reported to the Interstate Commerce Commission)

CURRENT STATE OF ITS BUSINESS *is reported to employees of the Erie Railroad in their monthly magazine. The report gives Erie men and women a quick look at the financial income and outgo for month and year to date*

Supervisors Play A Leading Part In Keeping Employees Informed

Studebaker Corp., South Bend, Ind., distributed in 1947 a condensed version of its financial statement to all employees and dealers. If the report failed to answer all the questions in the employee's mind, the management suggested that he ask his supervisor. To familiarize the supervisors with the report's details, the company had 650 of the daytime staff at a dinner and 100 of the second-shift staff at a luncheon just before the report was given out. President Paul G. Hoffman and Chairman Harold S. Vance explained Studebaker's operations. Employees were invited to request the full financial report if they wanted it.

Management is aware more than ever that one good way to keep employees informed is to keep its supervisors informed. They are closer to their men than any other representatives of the company. Unless management deals with them frankly and honestly, laying before them all the available facts, how can it expect the rank and file to know what is going on? That is why so many companies are waking up to the realization that supervisors must be the first line of communication between management and employees.

International Harvester Co. recognizes this fact. It has set up a program to take full advantage of it. Since late in 1946 it has "put its chips" on its foremen. It does a thorough job of telling them what is going on and relying upon them to pass word along immediately to the men under them.

Foremen receive information from management in two forms:

1. A weekly management letter is sent in a sealed envelope to each foreman. It contains current industrial relations and production news. It usually is a single sheet of paper and is specially written so that the foreman can read it to his men if he wishes or circulate it among them. The foreman is urged to read the letter to his assembled department, or if his department is very large, to have his assistant foremen read it to their own groups. This method does not work well in piece-rate departments, however. The preferred method is for the foreman to digest the news himself and then tell it personally to each of his men right on the job.

2. Management bulletins, which consist of news so hot that it cannot wait to be sent out in the weekly letter. If not marked confidential, the news in these bulletins is passed along to the men in the same way as the news in the weekly management letter. These bulletins obviously are issued irregularly. In emergencies, they may appear two or three times a day. Again, the lapse of time between them may extend over several months.

There is a third source of information for foremen—and for all Harvester employees. Letters to all company employees are mailed or passed out in the plants when the subject is of great importance and of wide interest. These letters are a medium for conveying information on policy outside the knowledge and scope of the foremen. A letter was mailed to all workers, for example, when the company raised the dividend rate on common stock. It told them why, taking the position that employees are entitled to know everything vital about the business. Another letter discussed the company's policy on grievances.

Many of the facts for the weekly management letter and for the management bulletins are gathered in each plant by an "information editor." A college-trained man with a news sense, he sees each day the top management men, the general foremen and some supervisors. He may talk with groups of workers, too. Foremen are urged to cooperate with him. He is a fact-finder and reporter who does not play favorites. Everything he writes is checked by top management. He gives candid information on such matters as changes of hours of work, number of shipments the plant is working on, reduction of or increase in assembly line, internal changes, statement of grievances, product pulled out of plant, or a new one pulled in.

Foremen should be first in putting the news, straight from management, into the hands of their men before the end of the shift. And that means all the news, bad as well as good. Rumors spread like wild-fire through a plant. They often cause unrest and uneasiness. But if the men know the facts, they are not likely to act rashly. Says the company to its foremen, "Tell them the news, and tell it first. It's the first punch that counts. Tell them the state of supply and production. You're getting a weekly bulletin on such things, and if a temporary shutdown is necessary because of lack of raw materials, they'll be prepared for it."

Many Employers Send Letters

A check by the National Industrial Conference

BOOKLET TOUR OF THE PLANT, *with "Al" explaining in non-technical terms the operations in every department, was given each visitor to the Open House of Allegheny-Ludlum Steel. Key production men along route answered questions*

Board showed that 54% of employers are sending letters to employees. The most effective way to distribute them is by first-class mail to the employee's home so that his family too can read them. Experience proves that such letters should not be sent too frequently. The shorter the letter, the better. One page is preferred. The facts should be presented in a friendly, straight-forward manner devoid of preaching. An important point: advance copies should be mailed to members of the supervisory staff.

The subject matter of these letters may be widely diversified. The Caterpillar Tractor Co. mailed a series of letters on the Taft-Hartley Law to all of its employees. W. H. Wheeler, Jr., president Pitney-Bowes Postage Meter Co., Stamford, Conn., devoted one of his quarterly letters to employees to an explanation of the company's new stock issue, describing the why and the how of getting new capital.

Plant and company-wide magazines and newspapers are favorite places to tell management's story to employees. The numbers of such papers run into the thousands. In fact, a count near the end of the war disclosed that more than 6000 companies published employee papers. No recent comprehensive check-up has been made. These papers, in general, devote more space than formerly to expansion programs, new products, shortages. Many have a President's column.

Sometimes papers and magazines are aimed at a particular group. General Motors publishes one for salaried employees called "As a Matter of Fact." Before it was started, a check was made to ascertain the need for it. Over 90% of the white-collar workers said that they would like to get more information about the company and its policies than they were getting.

Community daily newspapers often are used by companies to help "sell" themselves and their programs to the citizens, their own employees and their neighbors. Benjamin Electric Co. ran a series of paid advertisements in Arlington, Ill., and Des Plaines, Ill., newspapers outlining its policies.

Meetings of employees are a good way of disseminating company policy information in person rather than by the written word. One metalworking manufacturer with 14,000 employees tells his story periodically to employees in a series of sessions in his well-appointed auditorium. Some 2500 men and women attend each session until all 14,000 have heard the story. At every session the same top-management officials are on the program. Six or seven sessions add up to a grueling schedule for company officials, but they think the effort expended pays off. Another manufacturer has held departmental meetings, on company time, for years. Company programs are explained at these meetings. Smaller, more selective meetings with only 50 present were used to tell about this firm's postwar expansion program. These meetings, at which frank discussion rules, have done more than anything else to "keep things right" with employees.

Factory bulletin boards are used extensively

CHECK THIS LIST

In Preparing For An Open House

- ☐ See that plant is clean
- ☐ Nurse and first-aid equipment on hand
- ☐ Adequate toilet facilities
- ☐ Maximum safety precautions in plant
- ☐ Enough properly-instructed guides
- ☐ Stationary guides at key spots to answer questions
- ☐ Provision for transferring workers to shift on job when open house is held (so families can see husbands and fathers at work)
- ☐ Plant map, with points of interest marked, at beginning and end of tour
- ☐ Clear marking of visitors' route through plant
- ☐ Pamphlet for visitors describing main points of interest
- ☐ Arrangements for serving sandwiches and beverages at end of plant tour
- ☐ Ample car parking facilities, and policing of those facilities, for visitors
- ☐ Exhibits in individual departments
- ☐ Good advance publicity in the community

by management to transmit information to employees. Orders and rules usually are posted and, in general, any feeling of personal contact with the men is lost when these bulletin boards are the means for passing along facts. Nevertheless, some companies put on their bulletin boards their quarterly financial statements and other policy facts of interest to employees.

Payroll envelope inserts are a favorite form of handing along to workers a bit of information in a one-page, two-page or four-page pamphlet. These "stuffers," however, can easily be misused. They are not a good place to "campaign." And workers don't want to have their pay handed to them and find with it a lot of pious statements about how beneficent management is. The reaction to that can be deadly. If any literature is to accompany the pay check, stick to the facts.

Open houses, popular before the war, again are becoming an impressive means of showing employees, their families, their neighbors and the townspeople in general the working conditions and the manufacturing methods in a plant. It is an excellent way, too, to acquaint a large number of people with a company's products.

An offshoot of the open house is the exhibit of their products which some manufacturers hold for their employees. Some are premanent; others are "reruns" of trade-show exhibits.

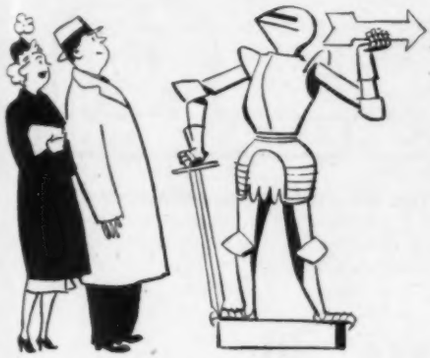
Some manufacturers do not subscribe to a mouse-like policy in talking to employees. They believe instead in a bold approach. The General Electric Co. illustrates the point. The management has been engaged since last October in a campaign to try to convince its 197,000 employees that they should forego a third-round of postwar wage increases. It has wished to eliminate misconceptions and misunderstandings.

A series of bulletins and a picture-story pamphlet have been distributed to employees. Topics have ranged from destructiveness of class war to the merits of the Taft-Hartley Law. The high cost of food and housing, size of General Electric profits and the adequacy of wages have been treated. The program grows out of a conviction by General Electric's management that industry has failed to apply the same resourcefulness and imagination to the task of winning the goodwill of its workers as it has to selling its products or encouraging financial investment. It is part of a long-range program of which the current third-round wage campaign is only a segment.

In its efforts to keep its employees informed, management cannot afford to be smug. It should not do a careless job, which might result in more harm than good. To quote Mr. Powlison again, "In making special reports to employees, employers have fallen short of their usual standards of performance as shown in the way they handle materials and machines. As it is, many of them appear to be making special reports to employees because other companies are doing so and it is, therefore, the thing to do. On that basis, the job can hardly be expected to be effective."

The fact is that workers are having data thrown at them from all sides. Much of it is out-and-out propaganda. It comes by word of mouth, by radio, in union meetings, by the written word. Workers are not sure just how much of it to believe. They are seeking the truth. They want the facts. The management which, in such a situation, is remiss in giving them the facts is making trouble for itself. The time is at hand when one of management's most important jobs is keeping its employees well informed of everything that goes on pertaining to its business.

TALKING SHOP



Plant Latchstring

PERMANENT OPEN HOUSE is, in effect, the policy at Worcester (Mass.) Pressed Steel. Founder John Higgins has devoted the top floor of the office building to an "armory," really an extensive collection of medieval arms and armor with additions of Stone and Bronze Age weapons, copies of famed stained-glass windows of Europe and an extensive array of present-day metal products, hand-forged, hand-chiseled and mass-produced.

The Armory draws many visitors, who are also invited to visit the plant. They follow a broad silver band painted on the floor, are unaccompanied. Tour lines pass through major departments, loop along inner edges of galleries in the two press bays, thus passing toolroom, grinding room and heat-treat while they overlook press operations. Officials report very favorable public reaction, benefits in plantkeeping, worker morale, better local understanding. Mr. Higgins advocates an "industrial museum" for every plant, and sets an outstanding example with his own. Don't miss it.

Carburizing Economics

FEW pack-carburizing furnaces have been installed in automotive plants since 1940. But pack carburizing will always be done in production plants. The furnaces are kept ready for action to carburize small lots and produce cases up to 0.090 in. thick, when needed. For production work, on the other hand, gas carburizing equipment is used, because the process is more economical and satisfactory cases can be produced—even up to ½ in. deep—as with armor plate made in the early part of the war.

The question of gas vs. pack carburizing is a matter of economics. Production costs have been cited in this order: gas carburizing—½ cent per pound of metal; continuous pack carburizing—1½ cents, and batch pack carburizing—2½ cents.

Skinning Costs

CHRYSLER'S Newcastle, Ind., plant is now shipping highly finished parts protected by "Seal-Peel," a tough thermoplastic coating developed during the war. Suspended on a string from a conveyor, parts go through a hot dip, can then be packed and shipped in tote boxes without further handling.

On receipt, parts can be stored indefinitely without deterioration. To use, the string is pulled and the protective coat peels off. Castings are collected and returned to Newcastle, remelted and reused.

Also, polished bumper steel is roller coated with a skin of plastic, then cold formed. The plastic prevents scratching and is elastic enough to stay with the steel, protecting the piece until it is ready to use. It then can be stripped off.

This plastic in transparent liquid form is now being supplied some Detroit service stations. When sprayed or brushed on bumpers and other bright parts it gives complete protection from road-salt corrosion and will stand the usual amount of winter washing, yet is easily peeled off in spring.

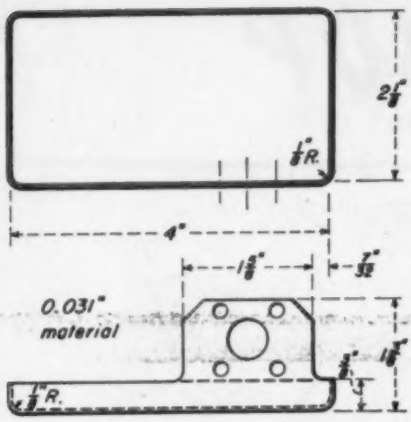
Anti-Novice

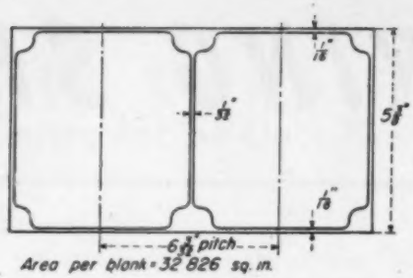
TO PROTECT FEED SETTINGS on a production machine tool against the novice operator who believes he knows feeds better than the job setter, the builder now supplies a lock if desired. Toothed collars behind feed dials are held by a lock bar carrying pointed arms. The rate setter locks a conventional lock and takes an ordinary key. Thus, if he operates the machine at all, the operator must observe the rates that mean proper finish and longest tool life.

All furnace temperatures and atmospheres in one large forging plant are set—and locked—by a man from the metallurgical laboratory. Each heater merely loads and unloads his furnace, and can shut it down in case of trouble. The lab man also maintains instruments and controls. In the heat treating department, the lab specifies temperatures, which the operator sets. Burned and spoiled work has dropped sharply as a result. All instruments in the plant, and the lab men, are under supervision of the company instrument engineer, thus assuring greater uniformity of product.

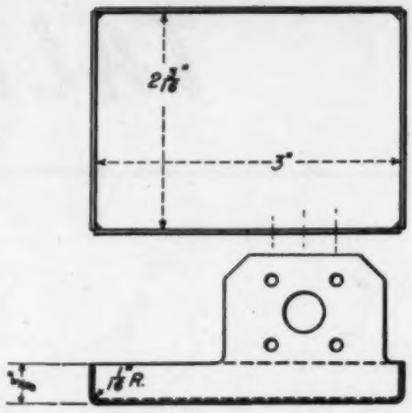
Bushing Does It

HORIZONTAL deep-hole drilling (3/16 and ¼-in. dia.) through SAE 1045 Brinelling 207 to 217 is being done by Leland Gifford with 200 in. and more between drill grinds. The answer seems to be largely in a new type of bushing, with four holes angling in from bushing circumference to the rim of the guide hole at the inside. An annular ring forces coolant through these holes, jets it at the point where drill enters work.





18 This part can be produced only by drawing. First efforts should be to develop a blank which will more nearly produce the desired contour relative to sidewall heights. If this fails, sides would be drawn of equal height



19 By eliminating corner radii the cover in Fig. 18 can be produced by folding, saving both material and press operations

How to Get the Most Out of Punch Presses...III

EFFICIENT USE OF MATERIAL

BY E. H. GIRARDOT, PUNCHING, TOOL, AND DIE DIVISION, GENERAL ELECTRIC CO.

Two-thirds of the cost of a punch-press part is material. Tooling that produces the part with least waste is the key to economical production.

SIMPLIFICATION of tooling and efficient material utilization are important factors in economical punch-press operation. Their vital role can best be appreciated when it is realized that 50 to 70% of the cost of an average punching is material value, with the balance representing labor and overhead.

The manufacturing economy which can be secured with punches and dies is well known. Because it is too often taken for granted as occurring automatically it is sometimes not achieved. Proper planning is essential to economical production, and that method should be selected which will result in the lowest ultimate part cost, which is calculated as the expense of producing a given number of pieces, plus the necessary tools. Selection of the best method in the planning stage is of prime importance. It is impossible to correct the tooling or change the method after production has started without wasting both time and money.

It is obvious that, with about two-thirds of the punching cost being consumed by material alone, the necessity of giving this problem full consideration cannot be over-emphasized. Close cooperation between tool and product-design sections is essential, if the ultimate goal of maximum economy is to be realized, since consideration of this factor should begin with the product design. Regardless of the method by which this cooperation is achieved, it must provide a ready means of collaboration between the interested people.

The tool engineer is in a better position to recommend design changes to facilitate tooling or to effect better material utilization, if he knows the exact purpose and requirements of the particular part. The design engineer will gain experience through this cooperation which should prove invaluable to him on future designs.

Overall benefits may be obtained in either, or both, of two ways. First, simplification of operations and tools required. A change in part design could result in the elimination of otherwise necessary operations and their tools. Again, it could result in making the part more adaptable for production in one operation in a progressive die. Second, benefits may be obtained through more complete material utilization.

A few examples of excellent collaboration between tool and product-engineering sections to achieve the lowest ultimate part cost are presented to illustrate the possible economies invloved.

For example, substantial savings could be anticipated through a change in design of the part shown in Fig. 18. Preliminary planning and study, based on a low to medium production, indicated that a

blank of deep-drawing steel of 32.8 sq. in. area would be required, and that five individual press operations would probably be necessary to produce the part.

Further investigation indicated that the part was to be used as a cover, and that the corners could be square and have slight openings. Discussion accordingly led to the adoption of a folded (Fig. 19), rather than a drawn, construction. Only two operations are now necsssary, in addition to the substantial reduction in the amount of material required.

After calculating the physical dimensions of the blank, material layouts should be made to determine the most economical method of ordering and running the material. These layouts are best made prior to actual design of the die, since the design necessarily varies in accordance with the method chosen. Material layouts fall into four general types or methods (Fig. 20), any or all of which may be tried as suggested by the shape and size of the blank. In some cases the available press and method of feeding the material may have a bearing on the layout chosen.

Angular Layout

Angular layouts are particularly applicable to those parts which require bending. The object is to so arrange the bend lines in relationship to the "grain" of the material strip that no bend will come parallel to it (grain is in the direction of rolling), in order to avoid fractures. A minimum angle of 30° to the grain of the material is generally satisfactory.

Common bright stamping steel may be purchased in various tempers, such as hard, ½-hard, ¼-hard and dead-soft. A cost differential of roughly 6% exists between the hard temper, a springy material suitable for flat work only, and the dead-soft temper, which is capable of being bent flat on itself in any direction. Economy is best assured through utilization of the hardest temper of material applicable for the job.

It will be noted that, in all the layouts, an amount of scrap equal to the thickness of the material, but never less than 1/32 in., is allowed between blanks in the material strip. A more generous amount is provided between the outermost contour of the blanks and the edges of the material strip. This allowance, usually 1½ to twice the material thickness, but never less than 1/16 in., serves a double purpose. First, it lends an added degree of stiffness to the skeleton, which resists breakage as the strip is pulled through the die. Second, since most strip material has some degree of inherent camber, this extra allowance allows the strip to shift slightly in the stripper guides and still prevent the punching from breaking out at the sides.

Single Strip, Straight Run

This method is based on nesting the blanks as closely together as possible in such manner that a single pass through the die will take all the blanks from the strip. Although, in effect, it is similar to the angular layout method, the direction of bends in relation to the grain of the material is not considered. In the event bends do come parallel to the grain, a softer temper of material is best used.

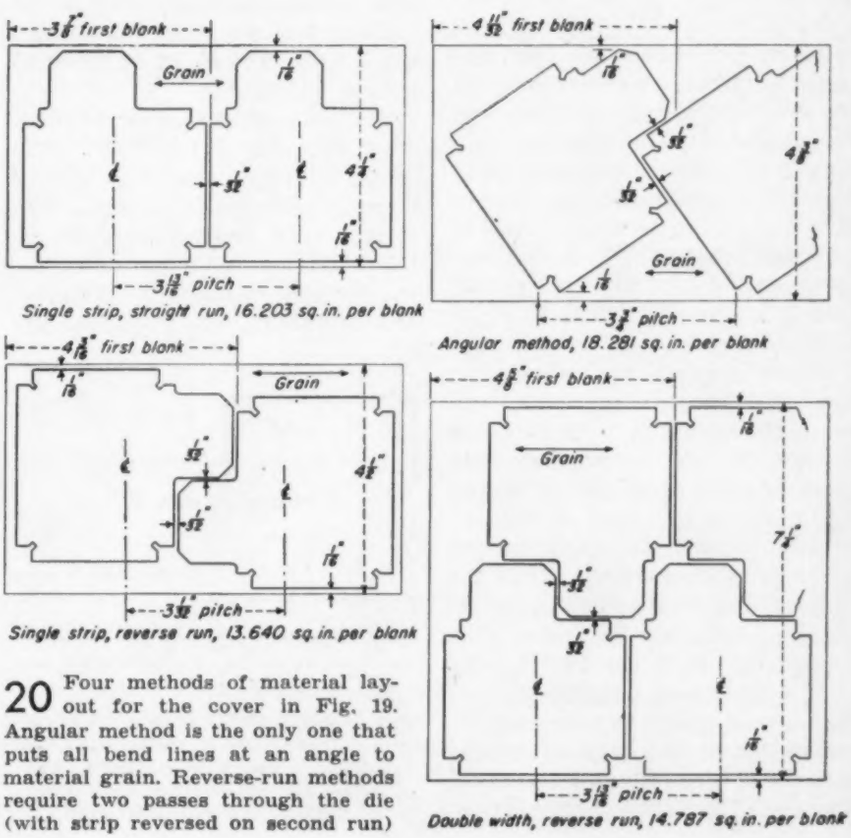
Single Strip, Reverse Run

This method sometimes allows closer nesting of blanks. Its disadvantages lie in the extra cost of operation, due to the necessity of reversing the material and running it through the die a second time. This extra labor cost varies from 10 to 20% depending upon the thickness of the material and the size of the part, and must be balanced against the value of the material saved over the other methods.

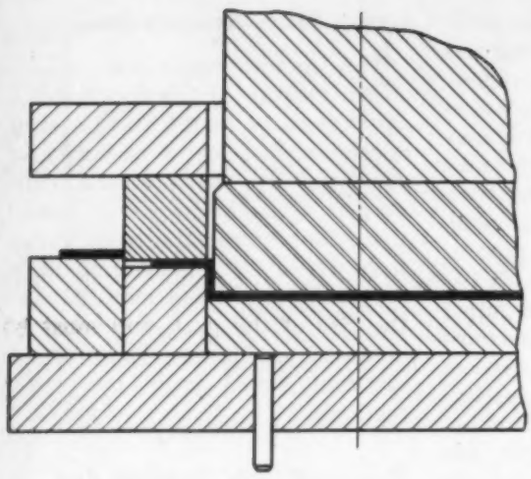
Double Width, Reverse Run

Occasionally, due to the shape of the part, this method proves advantageous. It has the same disadvantages as for the single width, reverse run, and the extra labor cost of operation must be balanced against the value of the material saved.

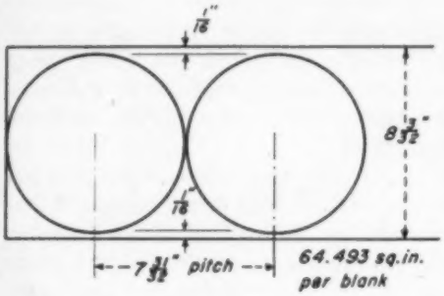
It will be obvious from a study of Fig. 20 that these layout methods can be applied to all blanking operations, regardless of the shape of the part or of the die-type used. The percentages of material savings shown between the various

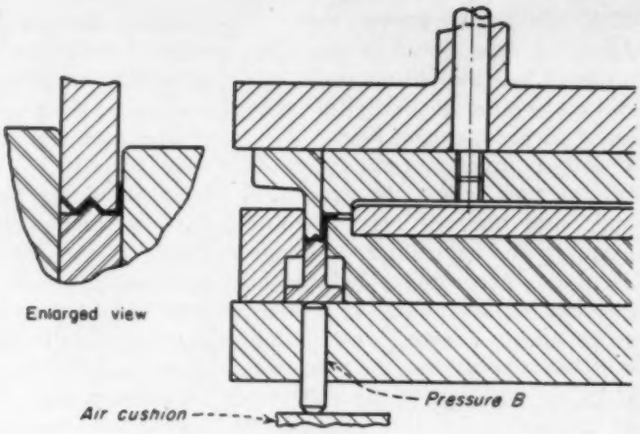


20 Four methods of material layout for the cover in Fig. 19. Angular method is the only one that puts all bend lines at an angle to material grain. Reverse-run methods require two passes through the die (with strip reversed on second run)

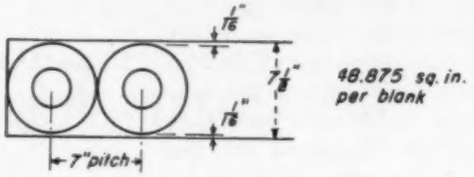


Material drawn from outside diameter





Material drawn from inside diameter



22 Draw ring produced by usual blanking and drawing method in a double-action press is better made with a design change in the flange which permits material for the sides to be drawn from the center. Two press operations are eliminated and 14.6 sq. in of material is saved per piece

PUNCH PRESSES *continued*

methods will necessarily vary in accordance with the particular blank at hand.

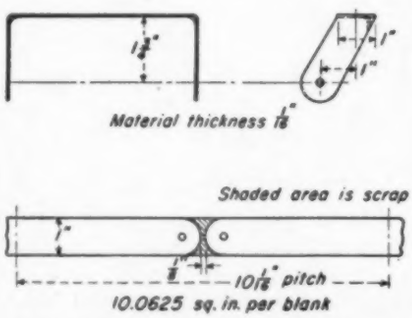
In this particular case, final decision amounts to a choice between the single-strip, straight-run and the single-strip, reverse-run layouts. Calculating the difference in the pounds of material required per 1000 blanks, the reverse-run method would take about 23 lb. less. Assuming a value of $0.05 per pound, then a saving of $1.15 in material alone is effected.

Since, however, the reverse-run method is more expensive to operate, the saving must be balanced against this extra cost. Assuming labor of $1.00 per thousand blanks and omitting overhead, a 20% increase in cost of operation, or $0.20, must be deducted. Thus, the single-strip, reverse-run method is chosen, because it proves the cheaper by $0.95 per 1000 blanks.

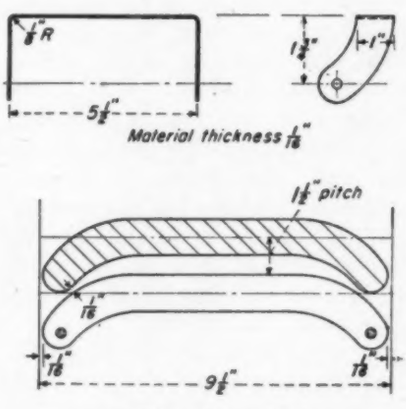
It is sometimes possible to effect a change in design to save material, yet maintain the original dimensions and general appearance of the part. The handle in Fig. 21 required a pierce and blank die with a material layout of 14.25 sq. in. per piece. The simple addition of a twist in the corners resulted in the utilization of a cheaper type of die, while only 10.06 sq. in. of material is now required.

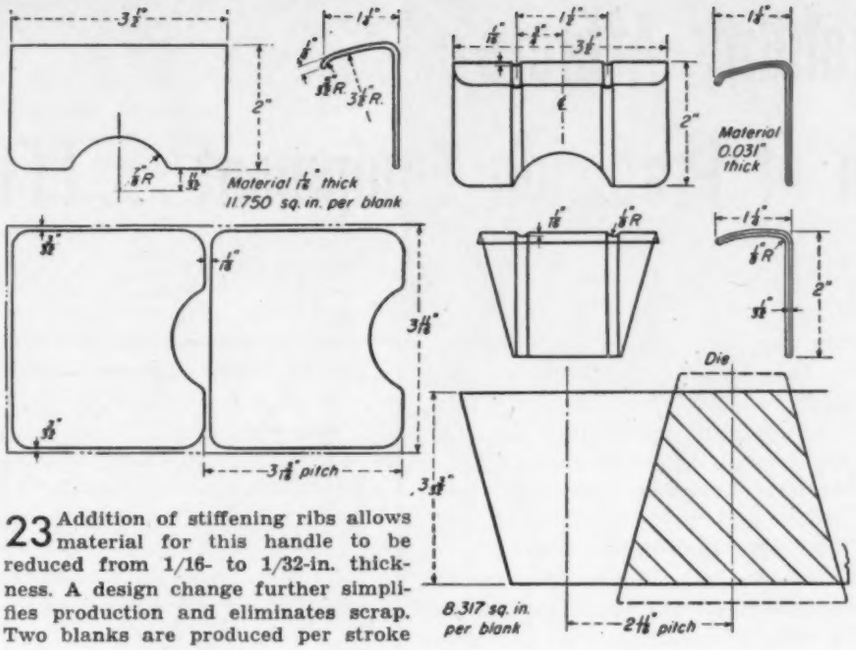
The usual method of producing a draw ring (Fig. 22) is to draw the shape complete, as a cup with a flange. The flange is trimmed, then formed in a second operation. A blank of approximately 64.5 sq. in., allowing ¼ in. on the diameter for trimming, is required. By changing the contour of the rim, it is possible to eliminate the material allowed for trimming and the operation of forming the flange. The rim is clamped tightly enough on a pressure pad to hold the blank, while the material necessary for the sides is drawn from the prepierced center of the blank. In this manner, only 49.9 sq. in. of material is required, or an overall saving of 14.6 sq. in., in addition to the elimination of two operations.

The inclusion of embossing, or ribs, on formed parts, is an excel-



21 Piercing and blanking die is required to produce handle at the top ,leaving a scrap skeleton. A twist to offset the sides gives better material use and eliminates skeleton





23 Addition of stiffening ribs allows material for this handle to be reduced from 1/16- to 1/32-in. thickness. A design change further simplifies production and eliminates scrap. Two blanks are produced per stroke

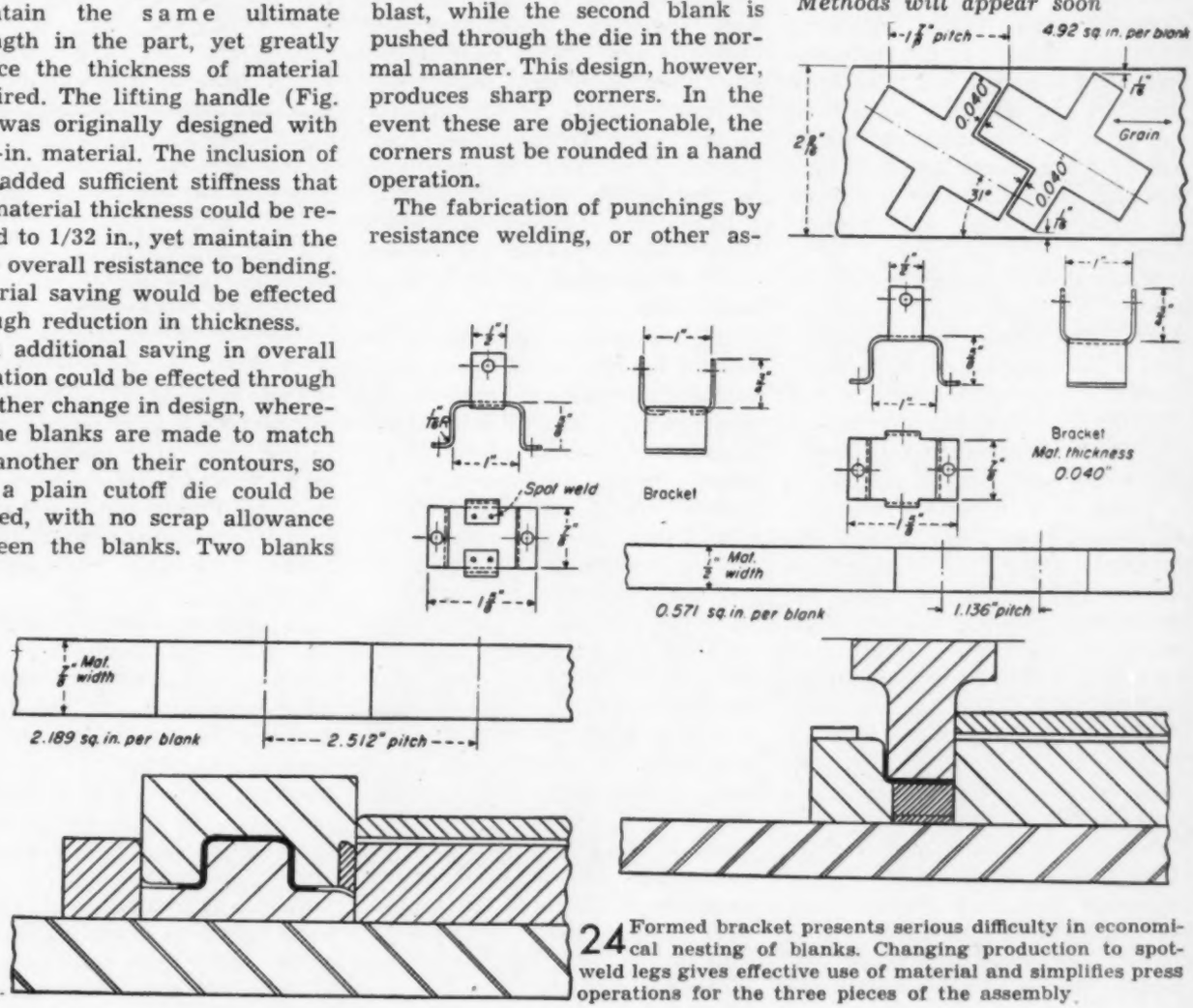
lent method of effecting substantial reductions in material requirements. Their stiffening effect will maintain the same ultimate strength in the part, yet greatly reduce the thickness of material required. The lifting handle (Fig. 23) was originally designed with 1/16-in. material. The inclusion of ribs added sufficient stiffness that the material thickness could be reduced to 1/32 in., yet maintain the same overall resistance to bending. Material saving would be effected through reduction in thickness.

An additional saving in overall operation could be effected through a further change in design, whereby the blanks are made to match one another on their contours, so that a plain cutoff die could be utilized, with no scrap allowance between the blanks. Two blanks are completed with each stroke of the press, the end blank remains on the die to be removed by an air blast, while the second blank is pushed through the die in the normal manner. This design, however, produces sharp corners. In the event these are objectionable, the corners must be rounded in a hand operation.

The fabrication of punchings by resistance welding, or other assembly methods, often presents opportunities for economy. The bracket (Fig. 24) is of such shape that a considerable portion of the strip material from which the part is blanked must necessarily be wasted, as can be noted from the layout. In addition, three individual press operations, one for each part, are required. With the fabricated design, a substantial gain in material utilization is effected. Final assembly is made by resistance welding the two upright legs to the main body of the bracket.

The foregoing illustrations bring out the application of simplification of tooling and material utilization as an aid in the achievement of the lowest ultimate cost. There can be no question but that it is one of the most important factors affecting economical punch-press operation.

Part IV, Piercing and Blanking Methods will appear soon



24 Formed bracket presents serious difficulty in economical nesting of blanks. Changing production to spot-weld legs gives effective use of material and simplifies press operations for the three pieces of the assembly

Dimensional Instability Affects Design of Precision Equipment...III

By FREDERICK C. VICTORY CHIEF ENGINEER, MOORE SPECIAL TOOL COMPANY

Suggestions are offered with respect to steels possessing good stability after customary heat-treatment, and a simple test for use after tempering

GROWTH or shrinkage of hardened steel is related to the presence of unstable constituents. As pointed out in the previous installment, the attainment of desired hardness value is not necessarily indicative of correct heat-treatment and structure. That being the case, it is desirable to explore the value of stabilizing treatments and to set up some simple means whereby one can predict if a piece of hardened steel will remain stable.

Much controversy surrounds the subject of stabilizing treatments. For a time, theory and inconclusive experiments seemed to point toward sub-zero treatment as being effective. More recently, reconciliation of experiment and theory sheds new light on this subject.

While it is true that sub-zero treatment, as a continuation of the original quench, is capable of converting a large percentage of austenite retained at room temperature to martensite, there are certain practical limitations to this method.

The danger of cracking unsymmetrical or delicate sections, as well as bulky ones, in quenching even to room temperature before tempering is well known. Recognizing this, proponents of the sub-zero treatment revised their recommendations to include a tempering operation interposed between the original quench and the sub-zero quenching operation.

Actually, this tempering operation rendered the sub-zero cycle very largely ineffective, Fig. 12. To explain this, one must differentiate between low-alloy tool steels and the high-alloy types, including high-speed steel.

In the case of low-alloy steels, a relatively low tempering temperature stabilizes the austenite sufficiently to render sub-zero cooling ineffective, but not completely enough to insure permanent stability. Higher tempering temperature and a longer time at heat completely decompose the austenite into stable bainite and effectively stabilizes the entire structure against further change during aging. In the latter case, sub-zero treatment can contribute nothing further to stability.

In the case of the complex alloy tool steels, including high-speed types, a somewhat different reaction occurs.

Quenching to room temperature seldom results in less than 20% retained austenite. Because of the presence of carbides, this austenite is sluggish. At temperatures which would result in austenite → bainite transformation in low-alloy types, the austenite in the second group is merely stabilized sufficiently to resist more than partial conversion by cold treatment. High tempering temperature (2½ hr. at 1050 F. for 18-4-1 types) results in a virtually complete austenite → martensite transformation on cooling to room temperature. Since more martensite is formed, the reaction increases the hardness and is responsible for the well known secondary hardness of this type of steel. Again, cold treatment is superfluous and can contribute nothing to stability.

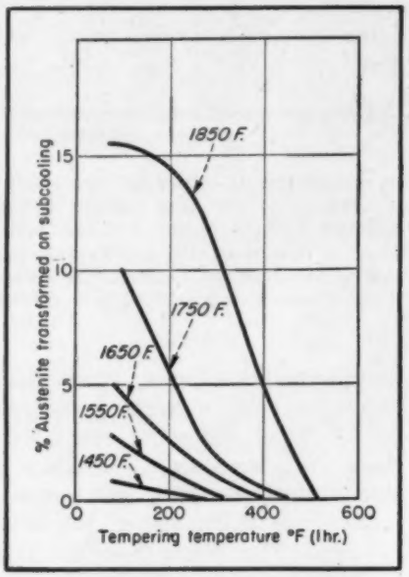


Fig. 12—These curves show the percentage of retained austenite transformed by sub-zero cooling (−321 F) of 1% carbon, 1.5% chromium, 0.20% vanadium tool steel. By selecting suitable austenitizing and tempering temperatures, there will be no retained austenite for sub-zero cooling to transform to martensite

Tests conducted by the writer substantiate this line of reasoning. In one case, a test piece was sub-zero treated under supposedly ideal conditions, but when examined by impartial technicians was found to contain 10% retained austenite.

Sub-zero treatment can convert the austenite in small uniform-section pieces, treated immediately after quenching and before the temperating operation, but does nothing to stabilize the tetragonal martensite or relieve stresses. A relatively long, high tempering cycle is necessary to accomplish these steps toward stability.

As an alternative to cold treatment, with its attendant dangers, a tempering cycle is proposed.

It is not the purpose of this

article to recommend specific cycles for each type of steel but one example will show how this principle was utilized by the Moore Special Tool Company, to stabilize an oil-hardening tool steel of the following analysis: 0.90% carbon; 1.7% manganese; 0.25% silicon. Normally, this steel would be quenched from 1420-1440 F. and drawn for one hour at 350 F. If all recording instruments were correct and there existed no thermal gradient within the furnace, the percentage of retained austenite should be negligible. In practice this was seldom the case and retained austenite averaged 10%.

If a draw of 400-410 F. is employed for 18 hr., the austenite → bainite reaction is carried virtually to completion, with stabilization of whatever negligible amount of austenite may remain. The resulting structure will be entirely stable dimensionally due to elimination of the austenite and stabilization of the martensite.

All of the writer's experience with dimensional instability points very strongly to the necessity of an inspection for potential instability after heat-treating. With the exception of destructive tests, the most practical method involves an accurate measurement of the workpiece after tempering, followed by a 2-hr. heat at the temperature specified for the stabilizing draw. If no dimensional change occurs, it may be assumed that the stabilizing cycle was effective. For example, in the case of the cycle prescribed for the steel mentioned above, a 2-hr. soak at 400 F. should confirm any suspicion of instability.

An Example

A clear-cut example of the necessity for such inspection will be found in the following incident:

Specimen: 18-in. leadscrew of the analysis given above, and supposedly subjected to the correct hardening and stabilizing cycle.

Observation: After three weeks at room temperature, the piece grew 0.0009 in. in over-all length. This growth created grave suspicion of dimensional instability not to be tolerated on this type of work.

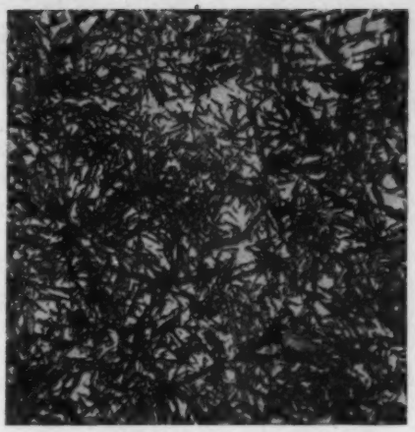


Fig. 13—Microstructure of section of overheated leadscrew. 500X magnification. The gray needles are partially tempered martensite and some bainite, while the white constituent is retained austenite

Dimensional Change: After holding at 400 F. for 2 hr. the sample grew 0.0125 in. in length. This could only be interpreted as evidence of excessive retained austenite. On this assumption other samples from the same lot were subjected to destructive examination, which confirmed the result of the test. This examination disclosed the presence of abnormally high percentages of austenite in these pieces (21% average) plus the coarse grain size peculiar to overheated steel, Fig. 13.

Conclusion: The austenitizing temperature used for these pieces was clearly excessive, as indicated by grain size, Fig. 14, and because samples not given the 2-hr. 400 F. draw showed 21% retained austenite, while those heated for 2 hr. grew 0.0125 in. in length. The inference is that the overheated screws, upon quenching, showed a hardness approximately equal to that normally expected after tempering. Therefore, the heat-treater dared not temper for fear of rejection on the basis of low hardness.

Fortunately, the tendency to retain large percentages of austenite is not inherent in all steels. By intelligent appraisal of the requirements of any application, it is possible to select a suitable analysis that will give the required physical properties, and at the same time to guard against excessive retention of austenite.

For example, the so-called nondeforming steels are prone to retain relatively high percentages of austenite, the constituent to which they largely owe their non-deforming characteristic. For applications where this identifying feature is not of paramount importance, that is, where grinding can be used to correct distortion, this type is not the most suitable choice.

Also, this particular group of steels is prone to great sensitivity to variation in austenitizing temperature. Furthermore, the low deformation index is predicated to a great extent upon a very narrow range of temperatures during hardening. As a matter of fact, very often steels more tolerant of thermal variation in hardening show an average deformation index as low or lower than the nondeforming types.

As a result of these factors, it would be well for the designer to

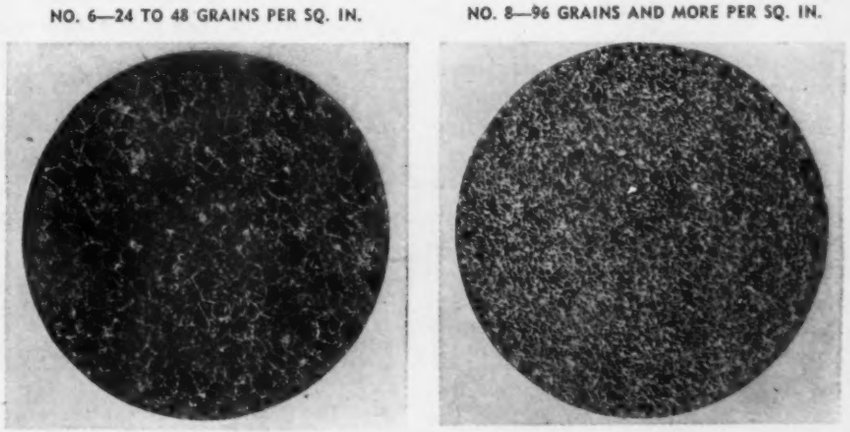


Fig. 14—Overheating of the leadscrew produced excessive grain size comparable to No. 6, whereas the normally expected structure is like No. 8, although a finer grain size (No. 9) could be obtained under ideal conditions

consider the selection of a steel offering a possibility of much greater stability under average conditions, such as are encountered when work is hardened by a commercial heat-treater. Thus, the engineer will avoid the danger of instability encountered in the preceding example, and graphically summarized in Fig. 15.

A Better Steel

Where a final hardness value of Rockwell C-60 is acceptable, a steel of the following analysis offers many advantages: 1% carbon, 1.5% chromium and 0.2% vanadium. Except for the addition of vanadium, this steel is basically the familiar SAE 52100, or ball-bearing, steel. It is less critical as to hardening range, the vanadium absorbing some of the carbon to form carbides, and thereby raising the temperature range at which grain growth occurs, as well as reducing the carbon content of the austenite. The latter contribution is important because the higher the carbon content of the austenite, the more resistant it is to conversion.

Normally, this steel should show a low percentage of austenite as quenched, and should produce a Rockwell hardness value of C65-66. This permits the use of a high tempering temperature 500 F., with a more complete stabilization assured as a result of the conversion of the austenite at an effectively high temperature, as well as complete tempering of the martensite. The resulting hardness should be approximately Rockwell C60.

Similar advantages are found in a steel having the following analysis: 0.90 carbon, 1.10 manganese, 0.35 silicon, and 0.55 chromium. In this type of steel the hardness penetration is very satisfactory and with a somewhat lower tempering temperature—450 F.—the same end result is obtained as in the case of the previous analysis.

This discussion is not intended to imply that the nondeforming steels are inherently unsuitable for applications requiring a high degree of stability. This is not the case. The point made is: While this group of steels is capable of satisfactory results in this respect, they require a great deal more care in treatment. Unfortunately in practice this is not always assured. While the suggested analysis should not be considered as "abuse-proof," it is at least much more tolerant of it without serious harm.

The 18-4-1 high speed steels are effectively stabilized by a multiple tempering cycle. After quenching in oil from an austenitizing temperature of 2350 F. to room temperature, the steel is tempered for 2½ hr. at 1050 F. This treatment effectively completes the austenite-martensite reaction; the actual conversion occurs during cooling rather than during the time at heat, which is a conditioning phase.

At this point, the martensite formed at the quench has been tempered, but that formed during the tempering has not. Therefore, the steel is brittle and unstable. A repetition of the tempering operation will temper the newly formed martensite and stress relieve the piece. For safety, a third temper should be specified to insure completion of the transformation and stabilization.

While different analyses require different temperatures, the general procedure and results should follow the pattern outlined.

Certain applications require a hardness close to the maximum as-quenched potential for low-alloy or carbon tool steel. It is apparent that attainment of this hardness is impossible when the proposed stabilizing cycle is used, because of the relatively high tempering temperature necessary.

On the other hand, as already pointed out, stress relief and stabilization of the tetragonal martensite, in itself, implies temperatures sufficiently high to present the same problem. This is the case even though cold treatment be used to effect the conversion of the retained austenite, with possibly a slightly higher final hardness value due to the fact that the transformation product of cold treatment is martensite rather than bainite as produced by tempering.

From this, it appears that a hardness of the order of Rockwell C64-65 required in such applications as gages and similar products cannot ordinarily be attained in the low-alloy or carbon tool steels with any assurance of complete stability.

While it has been generally accepted that these simple-analysis steels tend to be more stable than those of a more complex nature, this is a relative comparison and does not take into consideration the hardness equivalent at which the parallel is drawn. Also, the more exacting hardening-tempering cycle for the high-alloy types, with the greater attendant likelihood of error, has fostered this contention.

However, when high hardness values *and* complete stability are equally important, it is suggested that the analysis of the steel be determined on the basis of its ability to withstand a tempering temperature sufficiently high to insure complete stabilization without dropping below the minimum hardness requirement.

This would indicate a choice of the higher alloy type of steel, even though this implies a close control

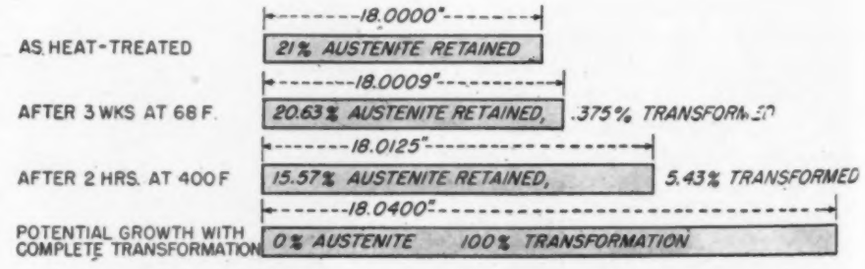


Fig. 15—Importance of unstable constituents upon dimensional variation of finished precision components is revealed by this graphical presentation of what happened to an 18-in. leadscrew. Growth of 0.0009 in. occurred from isothermal decomposition of retained austenite during three weeks exposure to room temperature. A low-temperature draw produced a growth of 0.0125 in.

of the hardening-tempering cycle as well as of the homogeneity of the steel.

Causes and Cure for Dimensional Instability in Hardened Steel

It has been necessary to use two installments of the series—Part II and III—adequately to explain the need for scientific and accurately controlled tempering of steels and selection of suitable types for applications where dimensional instability cannot be tolerated. The discussion of these matters necessarily rests upon a series of interrelated factors which, for convenience, are summarized below:

1. Dimensional instability of hardened steel can be attributed directly to the presence of two unstable constituents within the structure of the steel; namely, untempered martensite and retained austenite.

2. Untempered martensite, as formed upon quenching, is unstable and will gradually decompose at room temperature, causing shrinkage of the steel over a period of time. Incomplete tempering will only partially remedy this condition. Complete conversion of this tetragonal martensite to the stable, cubic structure requires an accurate time/temperature cycle during tempering, in order to avoid overshooting the target and result in too low a hardness value.

3. Austenite retained after quenching is unstable and will decompose at room temperature, with a resultant growth of the steel.

4. While retention of some austenite is practically unavoidable, the percentage will vary with the analysis of the steel and as a result of conditions obtaining during hardening.

5. The more carbon that enters solution during austenitizing, the greater is the tendency to retain austenite. The addition of small percentages of chromium and/or vanadium in tool steels is very effective, since these metals combine with a portion of the carbon to form carbides, which do not dissolve at normal austenitizing temperatures. This combination effectively lowers the carbon content of the austenite, rendering it more susceptible to complete conversion at quenching.

6. Overheating during the austenitizing phase of the hardening cycle dangerously increases the percentage of retained austenite in all types of steel. In the case of carbon steel, more carbon is forced into solution; in alloy steels, an increase in retained austenite is aggravated by the alloying elements dissolving in the austenite. Presence of these elements renders the austenite sluggish and much more resistant to conversion during quenching. High alloy steels, including high-speed steel, exhibit this characteristic to a marked degree.

7. Incomplete or interrupted quenching prevents complete conversion of the austenite to martensite, thereby increasing the percentage normally expected to be retained.

8. Sub-zero cooling is effective in transforming retained austenite, if the percentage is low and if the alloy content is not too high, provided the cooling is carried out virtually as a continuation of the quench. This practice is, however, likely to result in fracture. If the amount of retained austenite or if its alloy content is high, sub-zero cooling is almost completely ineffective.

9. Complete stabilization can be achieved by tempering. Relatively high tempering temperatures decompose virtually all of the austenite and effectively stabilize the remainder.

10. The utilization of tempering as a means of stabilizing steel against austenitic growth at room temperature fortunately stabilizes it against martensitic shrinkage, thus providing real assurance of stability.

Part IV of the series on dimensional instability will be published in an early number.

HOW TO GRIND AND LAP CARBIDE DIE PARTS—CORRECTION

In this recent special report it was stated that die shops, which contributed information, use diamond powders of grades 3, 4, 5 and 6 for lapping purposes. This was correct as far as those shops are concerned, but it was incorrectly stated that the above grade numbers correspond with the U.S. Bureau of Standards system.

To avoid confusion in buying diamond powders for lapping carbide, these distinctions in grading should be understood:

(a) Some plants make their own powders or buy them to grade numbers, wherein higher numbers indicate progressively smaller grain sizes.

(b) Other vendors grade their products according to the U.S. Bureau of Standards system, wherein the identifying number represents the mean micron size of the identified powder.

As far as the recommended powders are concerned, the accompanying table will show the grain sizes meant in terms of either grading system.

Diamond Powder Grades

Comparative Designations		Grain Size			
		Minimum		Maximum	
In article	Bur. of Standards	Microns*	Inches	Microns	Inches
No. 3	40	20	0.00078	60	0.00236
No. 4	25	13	0.00051	37	0.00145
	14	8	0.00051	20	0.00078
No. 5	8X	4	0.00015	12	0.00047
No. 6	3X	0	0	6	0.00023

*One micron 0.000039 in.

ROUND TABLE

Who Hires the Boss?

"Well, Ed, I see another petition's making the rounds. What's it about this time—stirring up a present for one of the boys who's getting hitched?"

"No, indeed. This happens to be about the boy who's getting unhitched from his job at the end of the month—Sampson."

"What has the replacement of the super got to do with the petition?"

"Sampson's always treated the boys fair and square; there isn't one who wouldn't give his right arm—as the saying goes. I don't wonder they are up in arms about someone else stepping in."

"Well, Ed, isn't that something for the management to worry about? I can't see where the men have anything to say about it. Of course, we don't know all the facts, and the management must have some sound reason for the change."

"What's wrong with the men having their say, Al? Seems like they should know something about a man they worked for for so many years. Sampson has gotten the boys together many a time in the last few years when it looked as though things were at the breaking point. We'd have had a strike on our hands last May if it wasn't for Sampson."

"I'll agree, Ed, the old boy did it. But that's not any more than he should do as a representative of the company. Of course there may be things about this affair that we know nothing about — something between management and superintendent—a matter of policy. I still think that the effort by the men to interfere is not right. Between you and me on the QT, I don't think it is any of their business. I think the decision is entirely a matter for the brass."

"You are one against many, Al. Just look at that bunch of names on those sheets making the rounds! Doesn't that mean anything to you?"

"Not a thing. I'll bet you a plug hat against a new golf ball that half or more of the names were written on that thing because 'everybody was doing it'."

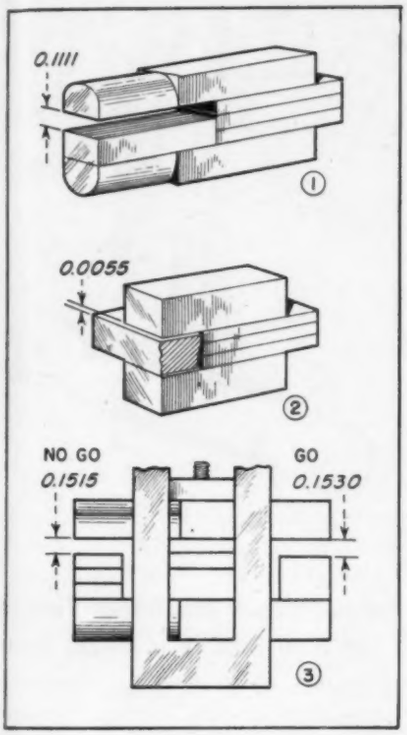
"That's possible, Al. But I still think it makes for a healthy plant when the employees show such an interest in the boss."

"I still contend that management should be the sole decider of policies which vitally affect the success of the establishment it is pledged to support. When things get around to the point where everybody tries to run things, then there is no direction."

"Pretty high-flown lingo from you, Al!"

HAVE EMPLOYEES A VOICE *in company treatment of supervisory personnel? Have they a right to take part in management decisions? What is your opinion? Others will be interested. Discussions of earlier topics appear on later pages.*

Practical Ideas



Gage-Block Assemblies Form Snap And Limit-Snap Gages Precisely

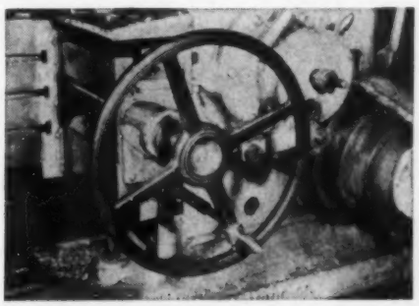
In a recent issue, Mr. A. J. Wormwood suggested the use of a 0.200-in. offset jaw for building up snap gage combinations smaller than 0.200 in. from the standard set of 81 gage blocks. However, a snap gage for any of the two thousand odd dimensions from 0.1999 on down to 0.0001 in. can be assembled, as shown in the drawing, from a standard set without using a shop-made offset jaw in the build-up.

The method of accomplishing this is to build up two stacks of gage blocks so that their difference equals the required dimension. Thus, for a gage of 0.1111 in., one stack is made 0.3111 in. and a 0.200-in. block is used for the second stack. In this manner there are many possible combinations, such as 0.4111 and 0.300, and 0.5111 and 0.400, which will form the required gage size.

The stacks are wrung between two precision jaws, such as are standard accessories to gage-block sets, and the snap gage is complete. See figure 1. If precision jaws are lacking, any two other gage blocks may be used instead, as in figure 2.

Limit snap gages, too, can be built up in a like manner. Figure 3 shows a gage for limits of 0.1515 and 0.1530 in. The advantage of using gage blocks only in such a case is that no special jaw must be made for every different tolerance, but a number of gages can be made up on the spur of the moment to meet separate requirements.

Obviously snap gages as assembled from gage blocks alone are more reliable than those using special offset jaws because it is difficult or impossible, by ordinary shop methods, to make the jaws with a precision comparable to that of the blocks. This method also allows the use of several gages at one time, made from the same set of 81 pieces. *S. Framurz, Bombay, India.*

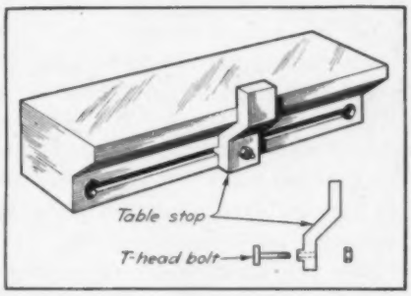


Auto Wheel Replaces Shaper Crank For Faster, Smoother Traversing

The conventional hand traversing crank on a shaper is anything but handy on jobs where the machine operator has to watch a line or shoulder and at the same time work the feeds carefully by hand. A more convenient arrangement is to install an automobile steering wheel in place of the crank.

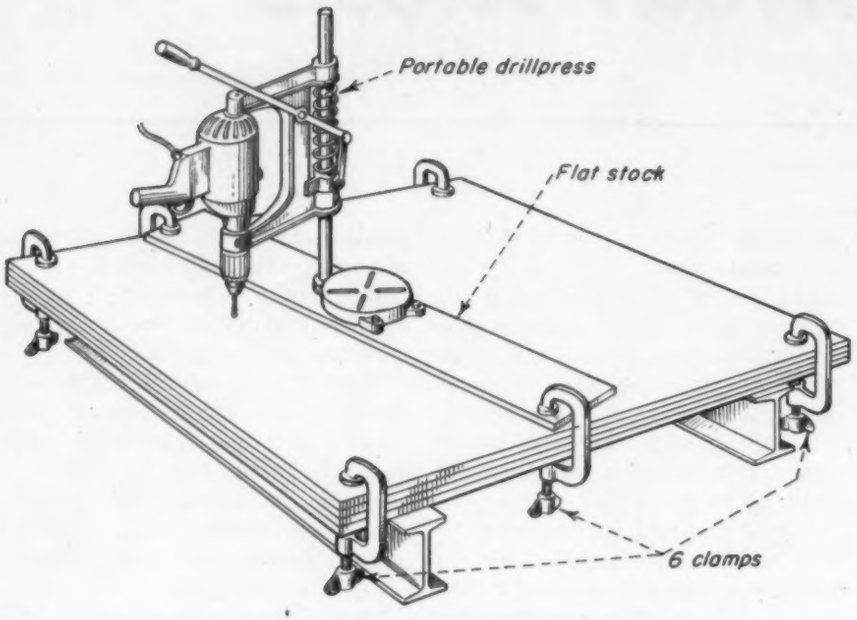
Remove the original hub and substitute one having a square hole to fit the shaper feed screw. For fast elevating and traversing a common spinning knob can be added, or, as shown in the photo, a more substantial knob can be made to fit a wheel spoke.

With this improvement the wheel can be grasped at any point without the operator taking his eyes off the work. *George W. Wilson, Mankato, Minn.*



Milling-Table Stop Aligns Work

As a substitute for the regular table stops and for many special purposes, table stops as illustrated were made to suit a particular machine, but can be easily adapted to any other machine. The castings were milled to match the front edge of the milling machine table. In this case it had an overhang. Bolts from long standard stops were used to hold the special stops flat against the table edge. Since the stops could be moved anywhere along the front of the table, they were used to line up castings and to furnish a registering point, as well as to line up straight pieces parallel with the front edge of the table. *Robert H. Kelsey, E. Syracuse, N. Y.*

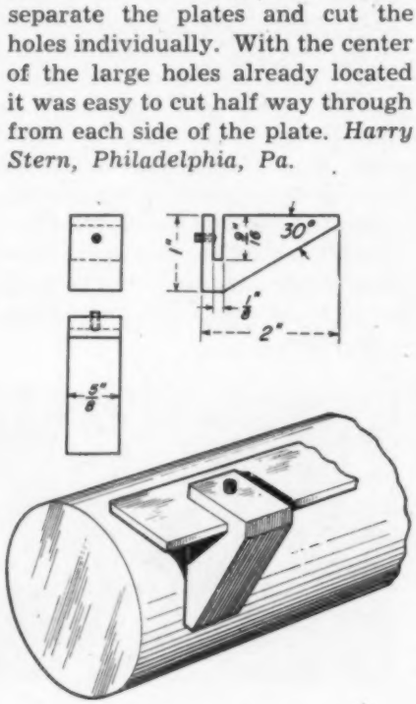


Large Panels Drilled with Press Mounted on Drill Stand and Plate

One of our recent problems was to drill, ream, and tap a number of holes of various sizes in four large broadcasting-station panels which were too large to be placed on a standard drillpress. We decided that it would be impractical to use an extension arm on the drillpress, so we resorted to using a ½-in. capacity portable drillpress.

We first clamped all four panels together and made our layout on the top piece. The drillpress was mounted on a drill stand, and the stand was bolted to a piece of ½ in. by 6 in. by 9 ft. cold-rolled steel. The drillpress could now be moved to any position on the panels and clamped firmly to them with C-clamps.

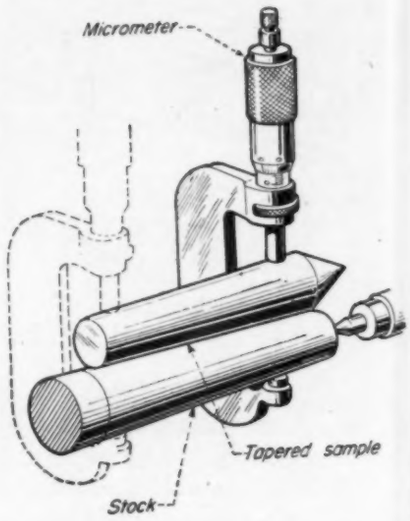
For the small holes we simply moved the press to the location, centered a centerdrill in the press over the punch mark for the hole, and then clamped the press. The larger holes were made by one of two methods. One system was to drill a smaller hole in the spot and then enlarge to proper size with a counterboring tool. Holes larger than 1¼ in. in diameter were drilled undersize and then cut out to size using a standard gasket-cutting tool equipped with a fly cutter and pilot. With the last method it was necessary to drill a small locating hole and then separate the plates and cut the holes individually. With the center of the large holes already located it was easy to cut half way through from each side of the plate. *Harry Stern, Philadelphia, Pa.*



Scale Blocks Speed Shaft Layout

Two scale blocks, used in conjunction with an accurate straightedge or scale, are handy when laying out a keyway or dimensions on cylindrical work.

The originals were made of cold rolled steel and were machined to guarantee straight and parallel edges. Used with a 12-in. steel scale, each was drilled and tapped for an Allen screw. *Allen B. Nixon, Springfield, Mass. Note: An item similar to this is available commercially.*

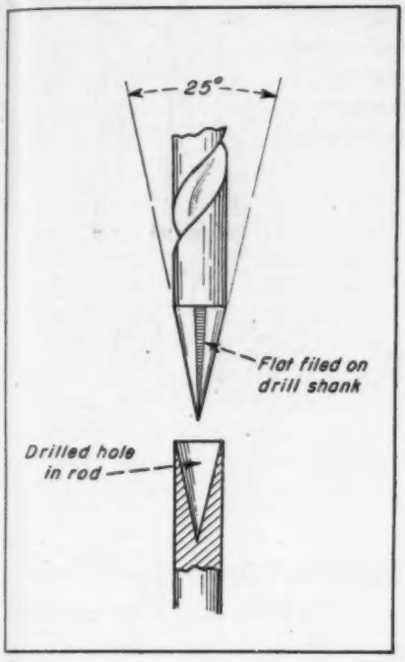


Sample Taper Job Gages Turning Of New Part to Identical Taper

The job of replacing a tapered part, or of turning a new one when a sample part of the same taper is available, can be done by using the tapered sample to gage the taper of the new part.

A trial taper of approximately the correct drift is turned on the stock by offsetting the lathe tailstock, but the dimensions of the stock are kept large enough to allow for corrections. Then the sample tapered part is held against the stock, as in the drawing, and checks at each end are made with micrometer calipers. Since the measurements are over both sides of the stock, half of the difference in the total end dimensions is the amount of correction necessary, so the tailstock can be reset accordingly. Two finishing cuts will make the correction accurate.

A final check with this method will allow the taper to be turned with as good an accuracy as the sample, provided the sample is not nicked or scratched. *Don J. W. Tibbits, Whitefish, Mont.*



Brazing Holds Drill Extension

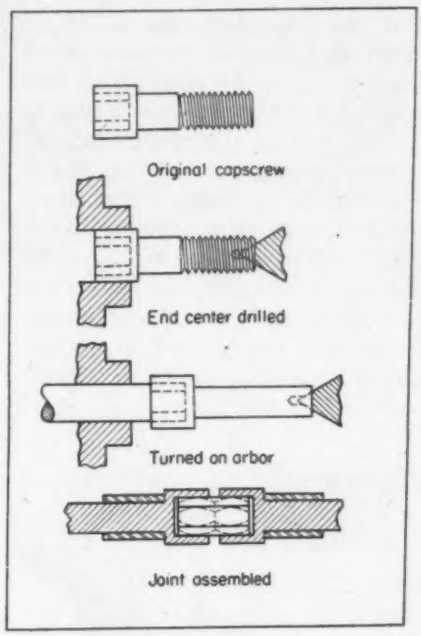
A drill for lathe or drillpress operation can be extended to get into those deep holes if an extension is brazed onto the shank of the drill.

The drill shank is ground down to about a 25° angle, and the extension, made of drillrod about 1/64 in. smaller in diameter than the drill, is bored out to the same angle. This can be most easily done by drilling a small hole in the end of the rod and following up with a drill ground to the correct point angle. It is a good idea to file a small flat on the surface of the cone on the drill shank to avoid any air lock when the parts are being brazed.

The drill and extension are brazed in a vertical position, and are afterward ground to remove all excess material. Silver brazing is recommended. *D. M. Birrell, Johannesburg, South Africa.*

Automatic Pencil Aids Compass For Colored-Line Layout Work

A handy variation of the bow compass will relieve the problem of high lead breakage and wear when layouts are being made with colored pencils. A cheap metal automatic pencil is brazed to the pencil-carrying arm of a metal compass. Cut the arm off about half way up the shank and line up the pencil with the stub for brazing. Breaking lead will cause less trouble, for a large supply is always handy. *Roger Isetts, Kenosha, Wis.*



Capscrews Form Flexible Joint For Limited Movement of Links

A production job involved the problem of making a number of slightly flexible joints which would stand considerable loading and would be inexpensive to produce and easy to pull apart. The solution was to make the joints from socket-head capscrews.

The capscrews were first annealed and chucked in a lathe, where they were centerdrilled at the ends. Then a mandrel was turned to hold the socket, and the screws were mounted between the mandrel and tailstock for turning the outside dimensions.

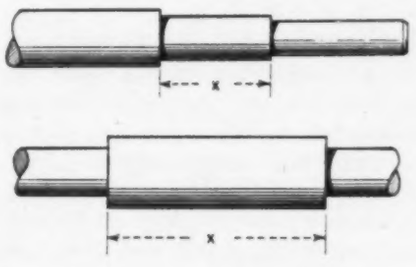
The joints were assembled using a short section of hexagonal wrench between the sockets. The wrench section was ground to allow slight clearance inside both sockets. The joint was held in place by two collar bearings which fitted the outside of the screw shanks.

If more flexibility is needed the hexagonal piece can be ground and curved toward the ends on each face. For an installation requiring limited torque capacity hexagonal brass stock can be used. *Edward E. Anderson, San Antonio, Texas.*

Procedure for Finishing Shoulders Gives Quick and Accurate Results

It is sometimes necessary to machine the distance between shoulders on a shaft to a close tolerance. If the shaft is on a production run this is taken care of by the tool setup, but for small job-lots and individual pieces run on an engine lathe it is difficult to measure longitudinal dimensions with any real accuracy. For close tolerances a scale is too clumsy and it is difficult to use a micrometer caliper on small shoulders and long shafts.

The difficulty can be solved in the following manner: All machine work is finished except the final cuts on the shoulders. There are two possible variations of the method of finishing the shoulders. The first, for a case when the shoulders face the same end of the shaft, is started by clamping the facing tool in position. The carriage is locked and the first shoulder is machined. A thread stop is clamped to the ways so that it will not have to be moved. In case a thread stop is not available, any block with a machined surface will do.



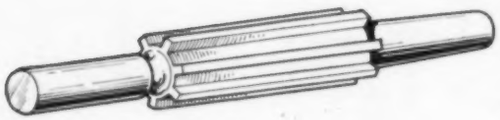
With an inside micrometer the distance between the carriage and stop is measured. Then the carriage is unlocked and moved to the second shoulder, but not locked. The distance between shoulders is added to the first reading taken on the micrometer and extensions are added to the micrometer, if necessary, so that the new dimension

can be set off on the gage. The carriage is adjusted to this spacing from the stop and locked. Be sure to check the distance after locking the carriage. The finish cut is then taken, and the result is an exact, known distance on the shaft.

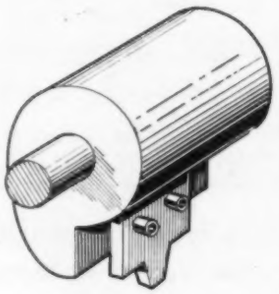
For the second variation, when the shoulders face opposite ends of the shaft, the setup is the same except that the facing tool is different. A rigid facing tool ground like a cutoff tool is used. It is mounted so it will finish face on either side with no change in setting.

The width of tool is measured with micrometers (outside). With the same setup as before, the first finish cut is made. The distance between carriage and stop is then measured. The carriage is unlocked and moved to the second shoulder. This time the first reading between carriage and stop is added to the distance required between shoulders plus the width of tool. The carriage is again locked, the dimension checked, and the final finishing cut is made.

If the shoulders are to be an exact distance from the end of the shaft the same method is used. The first finish cut in this case would be on the end of the shaft, and the system would proceed as above. The method is useful for machining an unlimited number of shoulders and for locating grooves, sealing rings and the like. The technique has been used many times and has proved to be fast and dependable. *Lewis F. Cheek, College Station, Tex.*



Brooch



Fly cutter

Splines Cut by Set of Broaches Using Single Progressive Edges

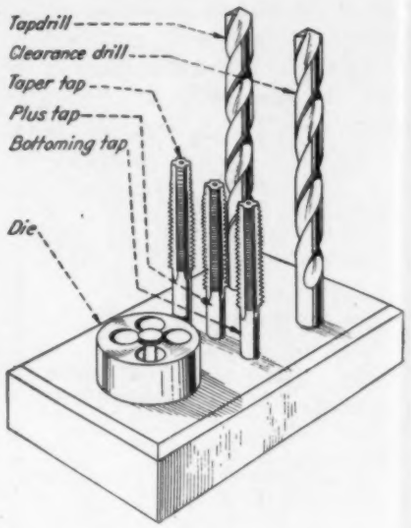
Rather than make a single, expensive broach to cut an internal spline in stainless steel, we made a set of progressive broaches, each of which took only one cut. The set was used in a punch press to cut a number of small splines.

The broach blanks were first turned on a lathe, where the broach outline, pilot, shank and undercut for chip clearance were formed. In addition, a number of shallow rings were turned on the shank to number the broaches consecutively in order of their use.

The progression of the cutting edges was provided by turning each broach 0.005 in. smaller than the previous tool in reverse order. The final, or finishing broach, which was the first one turned during machining, was only 0.002 in. larger in diameter than the next in order.

The teeth of the spline were milled into the broaches by a single point fly cutter. The advance of the minor diameter, again in reverse order, was made only 0.002 in. in each case by raising the milling-machine table. The result was a set of accurate, smooth broaches which, after hardening, could be ground and used indefinitely.

The broaches were used in a punch press, which was controlled by hand rotation of the flywheel. The broaches were self-centering and made absolutely straight splines. *Harry Stern, Philadelphia, Pa.*



Wood Block Groups Small Tools With Die Identification Label

A worthwhile improvement over common methods of grouping and holding small tools is this hardwood block.

The block itself is made of nonsplintering wood, and is rubbed with linseed oil for finish. Each drill and tap hole is at least twice as deep as the diameter of the shank, and no more then 1/32 in. is allowed for clearance in the hole diameter. The die is held by a dowel instead of by a hole, because of greater ease in handling and some chip cleaning ability.

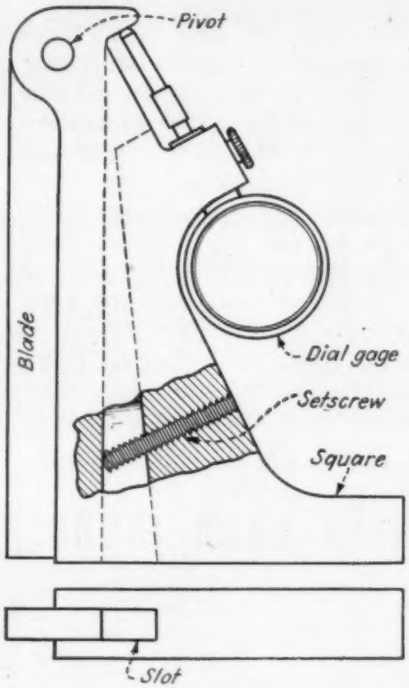
The die is placed on the dowel with its size and pitch designations up, which readily identifies the whole group of tools. *K. C. Valentine, Walpole, Mass.*

Paraffin "Freezes" Ball Bearing For Minor I.D. or O.D. Grinding

On an occasion when the only available ball bearing for a replacement will meet all measurements except either the outside or inside diameter, and it is not possible to change the dimension of the shaft or hub, it is still possible to make a good fitting. Provided the difference in dimension is only a matter of thousandths, and not enough to weaken the bearing, it may be ground by melting common paraffin and filling in the space between the balls and the raceways.

The easiest way to do this is to place the bearing on a flat surface, drop the melted paraffin into the spaces, and then allow to harden completely. Any jarring of the bearing and paraffin before they are cooled will impair the holding power of the paraffin. After hardening, the paraffin is cut away from the races and the grinding is done in the usual manner.

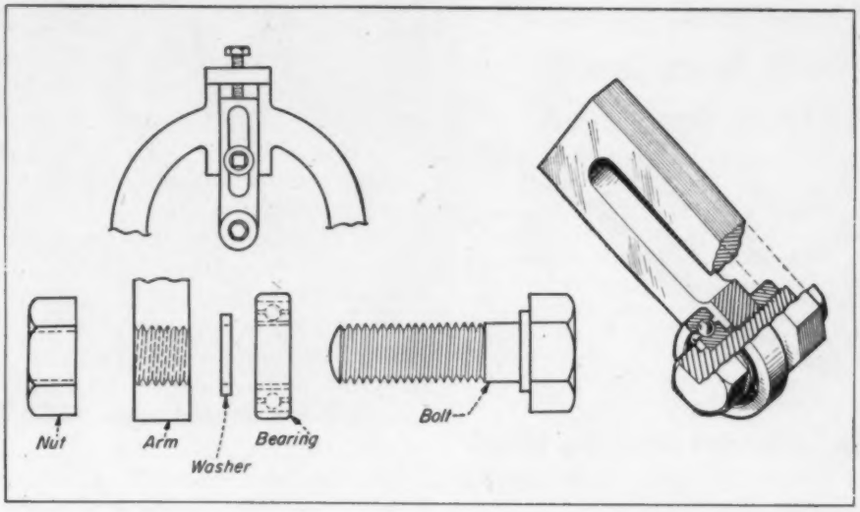
After grinding, the paraffin can be removed by immersion in hot water, which will allow collection of the paraffin on the surface for salvage. *Don Cameron, Jacksonville, Fla.*



Squaring Gage Indicates Incline From Vertical with Dial Readings

An accurate combination of square and angle gage should be valuable for shop layout and inspection work. This tool, which was cut on a shaper, will provide both a perfect square and gage for measuring angles only slightly out of the vertical.

The setscrew is provided to hold the blade in the correct position for squaring work. By setting the dial indicator on zero when the blade is square, the user can obtain readings on work that is slightly inclined. A table of conversion from readings to degrees must be calibrated separately for each gage, although a number of different gages could be substituted in the frame. *D. P. Campbell, Cincinnati, Ohio.*

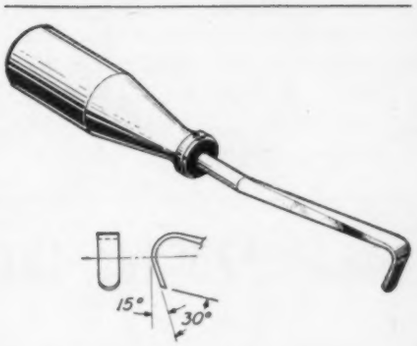


Bearings Prevent Stock Marking In Lathe Steadyrest Installation

A lathe steadyrest was converted into a ball-bearing rest with no change in the fixture being necessary by replacing the original arms with new ones fitted with the bearings. The drawing shows the type of rest changed in this case, although a smilar conversion is possible for other types.

The original arms were discarded and new ones, with a thicker cross-section to support the bearings properly, were substituted. Sealed ball bearings with 1¼-in. O.D. and ⅝-in. bore were used, and were held to the arms by means of ⅝-in. bolts. The bolt heads were turned down on their inner faces to provide shoulders which would bear against the inner races of the bearings. Thin spacers were assembled on the other side of the bearings for the same purpose. The assembled arms and bearings were held together by standard ⅝-in. nuts.

The finished steadyrest has been in use some time and provides for smooth rotation of the round stock being turned, as well as eliminating any scratching or marring of the stock. *William E. Blackham, Dorchester 24, Mass.*



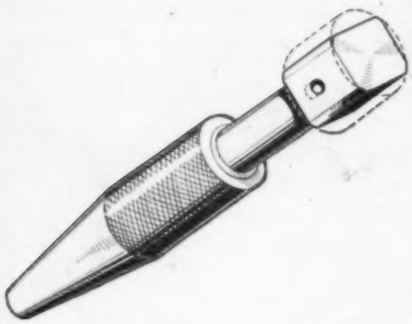
Draw-Cut Scrapers Clean Up Dies Deburr Holes and Finish Patterns

The tearing and clogging that was characteristic of our files when they were used on aluminum led us to develop scrapers for cleaning-up purposes.

The scrapers were made from ¼-in. and 3/16-in. drill rod and were ground down to slope gradually from the full diameter to about a 1/32-in. thickness at the end. The shank ends were threaded to fit into large handles. Heat-treatment consisted of tempering the scrapers to a light straw or yellow brass color to lend springiness.

The tools were varied in shape from a 120° V to a 1/32-in. radius.

They were used for touch-up blending of cuts on die castings, molding dies and similar types of cavity work, as well as for deburring holes. *Lloyd R. Fitsimmons, Portland, Ore.*



Socket Ratchet Twists Tap Wrench

A T-handle tap wrench can be adapted for operation in close quarters by grinding down the head to fit the next smaller size of socket wrench. Inaccessible positions can then be reached by using the tap wrench with the socket set extensions and ratchets. The grinding will not impair the operation of the wrench with its original sliding bar. *Edgar E. Walker, Milwaukee, Wis.*

Smaller Drill Used when Tapping Reduces Aluminum Thread Jamming

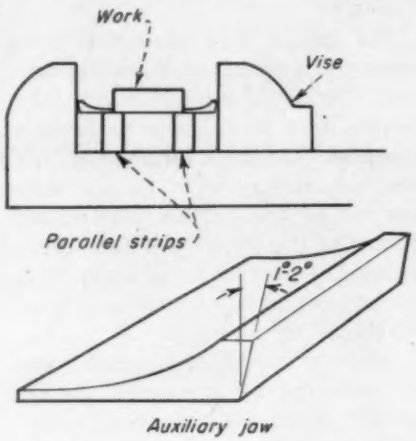
Tapping aluminum with precision is a difficult and tricky process because the elastic metal tends to flow away from the tap and then flow back into the hole after the operation, and also because the metal tends to form feather edges at the top of threads.

One method of reducing the jamming qualities of an aluminum thread is to drill the hole one size larger than is required for a given tap size. Thus, instead of drilling with a 5/16-in. drill, use a "P" drill, which cuts a 0.316-in. hole. This will allow the metal to form a better thread and will reduce seizing tendencies.

A coolant for aluminum tapping that gives good results is one of equal parts of kerosene and lard oil. *Roger Isetts, Kenosha, Wis.*

Extra Vise Jaws Hold Small Work

When shaping a part parallel by clamping it in the vise one often experiences difficulty when tapping the part down onto the parallel strips. This is particularly likely to happen when the bottom sides of



the part have not been previously machined or if the jaws of the vise are slightly loose.

Two easily made auxiliary jaws as shown in the sketch will clamp the part securely down on the parallel strips. The downward pressure of the jaws is produced by a slight inclination of the vertical side of the jaw. The side which bears against the work is made fairly thin so that small parts can be easily clamped with the jaws. By using the jaws it is possible to clamp small parts that lie below the level of the vise jaws. *Gerhard Wenke, Los Angeles, Cal.*

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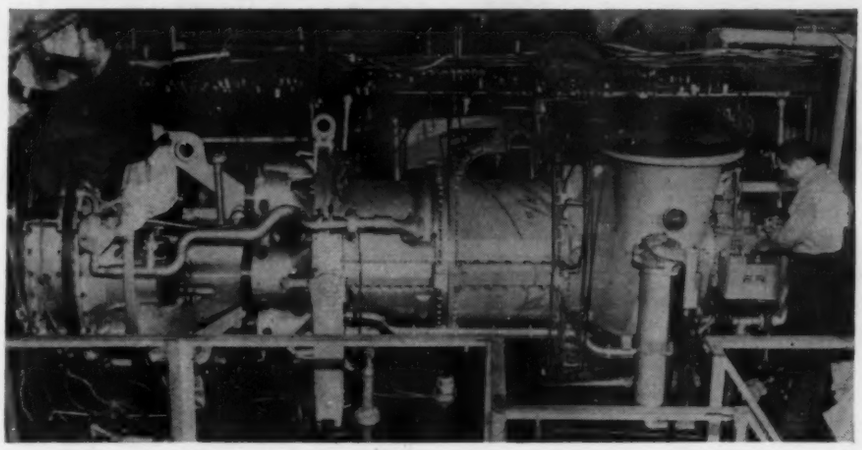
Forty-seventh Selection—Allen B. Nixon's Spherical Lathe Tool

NEWS OF METALWORKING



Locomotive Gas Turbine is shown being tested at General Electric's plant at Schenectady. Rated at 4800 hp., the turbine has been operated in factory tests since September of 1947 and is similar in arrangement to the TG-180 aircraft gas turbine which now powers the world's fastest military plane

Shipment of Iron and Steel Scrap From Germany "Next to Impossible"

WASHINGTON—"Bizonal Germany contains huge tonnages of scrap surplus to German needs"—but it is now next to impossible to process and ship any appreciable amount of it.

This is the essence of the report of an eight-man industry-government committee which went to Germany recently to study the possibility of exporting large quantities of scrap iron and steel to the hungry furnaces of the United States.

The committee found that virtually no special provisions have been made by the Army to expedite the collection, production and export of scrap from Germany. It was found that workers in the scrap industry are not included in the priority labor groups that are fed one hot meal a day, and that those who have not left the industry for one that provides the hot meal spend most of the time "scrounging" for food.

Although private scrap yards in Germany are overflowing with scrap, most of which is unsorted, the dealers are unwilling to sell for German money. Their scrap breaking, sorting and handling machinery, moreover, is antiquated and in a bad state of repair—with no replacement parts available. Transportation facilities are poor.

There are millions of tons of rubble scrap available. Much of it is concentrated at what were once Germany's prize industrial centers. The heavy concentration of the industrial rubble, and the proximity of transportation nets, makes the possibility of heavy scrap production easily feasible, according to the report. But, in the next breath the report points out that most of this same rubble could not be moved until the legal red tape was cut. Owners of the scrap are either fugitives or in prison as war criminals. Owners who have been given title to what was their pride and joy are reluctant to part with the remains. Just because the property has a war plant status, it can not be disposed of until reparations and other legal questions are adjudicated.

The committee report contains several pages of recommendations. Generally they suggest:

1. Incentives for workers
2. Cutting of military government red tape
3. Creation of a scrap expediter and staff within OMGUS
4. Creation of an Anglo-American purchasing corporation for processed scrap
5. Penalty spurs for Germans reluctant to part with their scrap
6. Establishment of a priority for scrap processing equal to that for coal mining in Germany.

How soon all these recommendations would be worked out, especially with the State Department replacing the Army shortly, is very much in doubt.

Price of Scrap Steel and Iron And Demand Dip

CLEVELAND—A decided softening in both demand and price of scrap and steel has been noticeable recently in the Midwest. One steel producer turned down an offering of scrap recently, not because the price was out of line but that because the mill had no immediate use for it and the company had decided against stockpiling at this time.

Price has apparently stabilized at about $40 a ton in Cleveland and about $40.50 in Pittsburgh with plenty of all grades available except for No. 1 heavy melting scrap.

The latter is scarce because of continued heavy use by foundries who are in many instances compelled to use this heavy melting scrap to take the place of very scarce pig iron.

A further softening in price, perhaps by as much as $1 per ton, would cause no surprise to mill buyers within the next few weeks since, with the advent of Spring, scrap is starting to move with accelerated speed.

Steelmakers are well aware of the large volume of scrap which is available at Detroit and which has been moving to the mills at a good pace for the past week or so. Steelmakers in the Cleveland area are also aware of the large volume of scrap available in the Chicago area and being offered in large lots at up to $1.50 per ton under the quoted price. Scrap is being received in such quantity in the area now as to present a storage problem.

Following a severe winter in the New England area during which shipments of scrap, and just about everything else, were tied for periods of considerable duration, scrap is moving freely there now and in heavy quantity.

Definite soft spots in scrap now are in foundry and alloy scrap. The latter is extremely spotty at present with a continued weakening trend.

Foundry Unit to Meet

CLEVELAND—The first annual meeting of the Foundry Education Foundation, formed about a year ago and which has raised $300,000 among its 500 members for scholarships in six universities and technical schools, will be held in Philadelphia to coincide with the meeting of the AFA.

Hillman Minx, four-door sedan manufactured in Britain, was exhibited recently in New York where it was announced that the newly-organized organization, Rootes Motors, Inc., will handle the sales and appoint distributions in other areas. The car is competitive with American light autos

British Pressing to Export Autos To U. S., Canada, to Obtain Dollars

LONDON—British automotive manufacturers are driving hard to bring badly-needed dollars into the country by exporting vehicles to Canada and the United States, as well as to other countries.

Foreign sales of new motor cars and taxis in 1947 mounted to 125,788, more than double the number sold in 1946 and nearly three times the 1938 mark.

However, the British are fully aware that these markets will be of short duration—thus they are putting the pressure on for immediate deliveries.

The Board of Trade estimates that 12,000 to 20,000 passenger cars will be exported to the United States in 1948. This compares with sales amounting to roughly 1,100 in each of the past two years and to only 45 in 1938. Canada, which has purchased nearly 2000 British-made cars last year, four times the figure of 572 in 1938, is counted on to absorb a considerably larger number this year.

$14 to $24 Million Expected

Measured in dollars, the British export of cars to the United States should net them somewhere between $14 and $24 million.

Detroit, however, can afford to shrug off this British competition. It does not point to any long-term loss of the home market to foreign-built cars. The British are not counting on the present fat market for their models in the U.S. lasting beyond the point when American carmakers catch up with domestic orders.

Austin Motor Co., Ltd., of Birmingham, has been setting the pace up to this point with sales running around 1000 a month. Just recently Austin's New York agent cabled that he could use twice that amount with immediate shipment. Austin expects the U.S. market will take 10,000 to 12,000 cars this year. Rootes Securities, Ltd., is close behind Austin. Other concerns are hopefully pushing their production.

The Rootes concern has organized an American company, Rootes Motors, Inc., Long Island City, N. Y., as principal U.S. distributor.

Surplus Ruling Helps Veterans

WASHINGTON—Veterans may now purchase any item of government surplus personal property without a priority certficate, War Assets Administration announced recently.

A year ago, WAA abolished the certification of veterans for priorities in the purchase of all types of surplus personal property except aircraft, commercial laundry equipment and railroad transportation equipment.

There are no exceptions under the new order, and a veteran may qualify for priority purchase of any item of surplus merely by showing discharge papers and signing a statement concerning ownership of business and purpose for which surplus is bought.

The order does not affect disposal of surplus real property.

Nuclear Energy For Airplanes Claimed Vital

WASHINGTON — Nuclear energy propulsion of aircraft (NEPA), already under development by the Air Forces, is recommended by the Congressional Air Policy Board for highest priority in the atomic program.

NEPA would enable aircraft to stay in flight indefinitely as far as fuel goes. Enormous heat from a small "hot pile" will either generate steam or other vapor, or more likely be applied to air in the conventional-type jet engine. The main problem is to obtain quick heat transfer in absence of combustion.

NEPA has been regarded as a long-range prospect, therefore as a stepchild, by both the Atomic Energy Commission and the USAF. But, Fairchild Aircraft, which has the development contract at Oak Ridge, is said to have inspired the boost by the Air Policy Board, in hope of a quick jump over slower steps envisioned by conservatives. AEC wants to take over NEPA, but USAF is determined to hold it.

Atom propulsion of submarines is under development by the Navy and will be realized ahead of NEPA because the shielding weight problem is easier.

Among the other recommendations of the Air Policy Board are included:

Experimental aircraft production contracts should be performed with minimum necessary tooling, because tooling for regular production may be different.

Design and production contracts should be planned overlapping. Time limit on long-range project contracts should be extended to five years.

Sub-contracting should be encouraged for quick results, but full control and responsibility should remain with the prime contractor.

Contract termination procedure similar to that developed in the war should be provided in peacetime.

Inventions reduced to practice before contract work is begun, also those in normal lines of activity of the company, but subject to non-exclusive license by government. Those not in company line, developed during contract work, should be subject to negotiation to U.S. use. Where no research is involved, the government should acquire no rights merely by procurement.

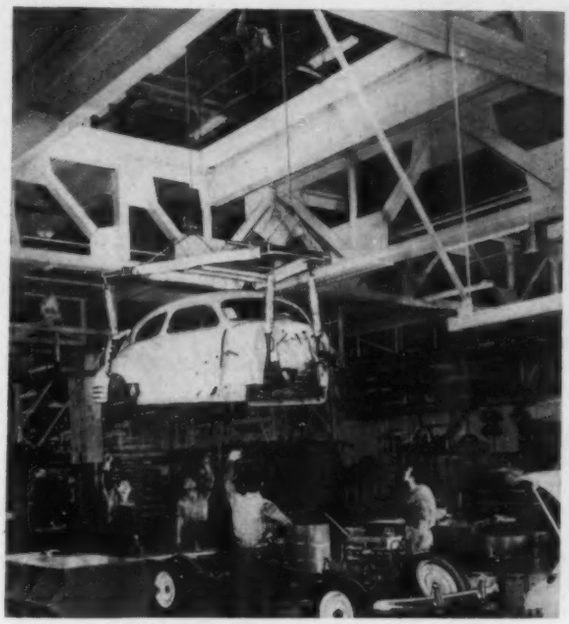
Because joint chiefs of staff failed to produce aircraft requirement recommendations under merger of armed forces as affected by the Security Act of 1947, the Board did not specifically propose appropriation. The aircraft industry is left uncertain as to fiscal 1949 orders.

Detroit

LABOR NEGOTIATIONS EXPECTED TO DRAG ALONG... MANAGEMENT WARY OF COMMODITY PRICE BREAK... ALUMINUM IN SPOTLIGHT

Labor negotiation season is at hand in the automotive area. The CIO United Auto Workers Union is in the early stages of its bargaining with Chrysler and General Motors, and expects to extend its operations in the near term.

The situation boils down to something like this—the union, seeking a package raise of approximately 30 cents an hour, is being faced by an industry position which is shaped by two factors—the expectation of a good automotive market and the attendant desire to stay strike-free and participate in it, also the fear that recent breaks in commodity prices may signal the end of that market, necessitating a very conservative attitude on raises.



New Assembly plant of Chevrolet went into operation recently at Van Nuys, Calif. Thirty million dollars for parts and supplies will be placed with West Coast manufacturers, the company reports. The factory is expected to turn out 50 cars and trucks per hour in the 1-million sq. ft. layout

Extended Negotiations Seen

At the moment, the last point dominates management thinking. There is far less inclination to grant advances of almost any size than there was two months ago. The outlook, therefore, is for extended negotiations which may drag on until the bargaining in pattern-making steel and electrical industry reaches some sort of guidepost settlement.

"Pattern-making" calls to mind the continued and growing distaste of all industry for uniform wage settlement. But there is no great hope that patterns will be eliminated this year. In fact, the ultimate elimination of them is made extremely difficult by reason of the multi-plant company operations. When the big companies give a uniform raise throughout their establishments, outlying neighbors have little choice but to follow suit—and uniformity reigns.

For the moment the auto industry is relatively strike-free. The only impediment to production continues to be steel. Shortages of that material cut down General Motors operations early in March and affected the industry-wide total. This rather unexpected development—tightness had not been expected until some few weeks later—reduced weekly production figures away from postwar record territory.

Sag Due at Ford

About the time General Motors assemblies build up, another sag will accrue in the Ford sector. Ford is moving a bit faster toward its changeover to 1949 models, and its assembly rates will be subject to decline before too long.

The Ford changeover is expected to be completed by May 1. Meanwhile, between 20,000 and 25,000 Rouge employees will be idle for periods from two to six weeks, in some cases longer. Another 8,000 will be laid off in the company's 14 assembly branches. Some balancing of these declines comes out of the Lincoln-Mercury operations, which have already gone through their changeover cycle.

Pinched by steel, the entire auto industry is highly interested in aluminum at the moment. One quiet series of studies is proceeding on the desirability of shot peening it. Improvement of steel physicals by peening is a well-established fact, but the use of the process on aluminum is definitely new.

Kaiser-Frazer Corp., intrigued with the lighter metals since the company's birth, is switching parts to aluminum as fast as it can to protect its already enviable steel position. Dies for die cast aluminum doors for the K-F cars are now in process and will be ready for production runs in June. Costs of the steel and aluminum doors are said to run about equal, with advantages of weight, fit and weather sealing accruing to the lighter metal.

K-F to Install Presses

K-F, it should be noted, is planning to install ten new Clearing and Bliss presses during April, making the company more self-sufficient on its body stamping work. An entirely new overhead conveyor system will be built at the same time to move the pieces between presses and transport them to finishing departments. Pending the reshuffling of the pressroom, a bank of stampings is being built up for the forthcoming output.

Experimental work of a general nature is being considerably expanded at Fisher. The division's experimental and development section now numbers about 200 technicians, occupying some 80,000 sq. ft. of floor space. The section works closely with product engineering, trim engineering, and tin and hardware styling sections. Some emphasis appears to be concentrated on stress analysis and kindred work.

Movement of the 1949 body program at Buick is signaled by large advertising in Detroit papers and elsewhere seeking wood and metal patternmakers. Buick, like other General Motors car-making divisions, is well along on its engineering for new models, and is working hard to translate blueprints and mockups into tooling.

Expansions Reported

Nash-Kelvinator Corp. has expanded its facilities at Grand Rapids, where Leonard refrigerators are made, by purchase of the 600,000-ft. Sligh Furniture Co. plant. It will be used for warehousing and manufacturing, and will increase the corporation's Grand Rapids space by about 50%. Another western Michigan expansion of note is the purchase of a 60-acre site near Ionia by Sealed Power Co. for erection of a $2-million foundry. About 125 workers will be employed to make castings for piston rings. Initial capacity will be about 2 million rings a month for automotive use, plus another 250,000 for larger power plants.

Security Resources Board in Full Swing on Long Range Study Topics

WASHINGTON—The National Security Resources Board, until recently a "paper" organization established by the National Security Act of 1947, has started to work.

Even before the release of the agency's organization chart in mid-March, the board had initiated investigations in oil, economic stabilization, manpower and passive defense for industry. The latter, which entails such problems as dispersal of plants, underground construction, and other protective devices, is a long-range study which will attempt to answer the as-yet unanswered question of how to protect our vital industry in another war.

The Board's organization chart shows four administrative sections and 20 mobilization planning staffs. The four administrative sections, working under the main board, include the offices of the secretary and the general counsel, a programming division, and a public information division.

The 20 planning staffs are broken down into four general groups, industrial, material and human resources, and organization and management.

The staffs and their fields are as follows:

1. Industrial resources. Covers power, utilities, transportation, communications, and production facilities.

2. Material resources. Includes petroleum, iron and steel, fuels, chemicals, rubber and plastics, nonferrous metals, non-metallic minerals, timber and forest products, textiles, fibers and leather, and agricultural products.

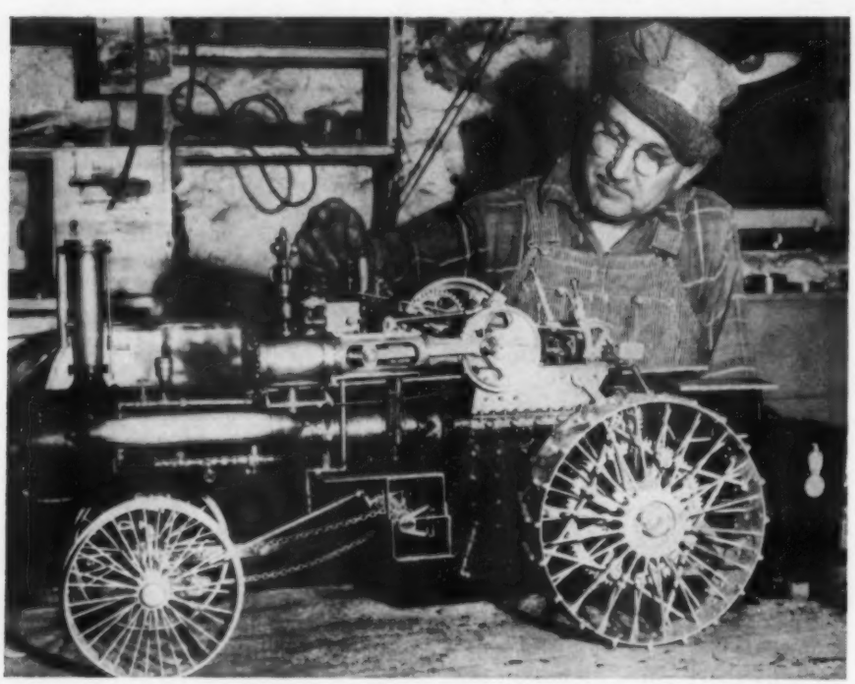
3. Human resources. Covers manpower, medicine, war information, and censorship, and community facilities and activities.

4. Organization and management. Covers economic stabilization, foreign economics, and organization and procedures.

Each mobilization planning staff has the following functions, as related to its field.

In coordination with the program division, assists in the development of concepts, principles and assumptions for mobilization; develops and evaluates potential requirements, resources and deficiencies, and measures to overcome such deficiencies; formulates projects and plans their implementation; develops and evaluates policies and plans for mobilization.

Each staff also works under the secretary preparing reports for the board; utilizes advisory and interdepartmental committees; collects and maintains essential information; maintains liaison and secures coordination with appropriate governmental departments, agencies, and private organizations.



Old Steam-Driven tractor is modelled by Machinist Warren A. Taylor, Kansas City, in his home workshop. Built on a scale of two inches to the foot, it is 41 in. long and weighs about 200 pounds. Whereas the old tractors used wood or coal for fuel, the model gets up steam with charcoal heat or compressed air

BLS Sounds Warning

WASHINGTON—Few statistics will be available to business if the Senate accepts the House cut in Labor Department appropriations for next year, the Bureau of Labor Statistics warns.

The proposed cut of 60% below what was spent a year ago will force 375 of BLS's 1000 employees off the payroll.

President Asks Liquidation of War Assets Unit

WASHINGTON—President Truman has recommended to Congress that War Assets Administration be liquidated and remaining functions transferred to Federal Works Agency. Priorities and preference requirements on personnel property should be eliminated, while those applying to real property should continue until Dec. 31, 1949, according to the President.

He also suggests transfer of the Bureau of Federal Supply from the Treasury to Federal Works, to consolidate disposal and purchasing in one bureau.

In his report to Congress, the President said that by June 30 this year the total amount of war property declared surplus will have reached nearly $40 billion, original cost; with all but about $6 billion in property disposed of.

Of the original $40 billion, property costing about $11 billion was located abroad. Of this only $600 million will be left unsold by June 1. The other $29 billion represented property in the U.S. Of this, $10 billion was in consumer and producer goods, and on June 30 only about $500 million will be left on shelves. Another $10 billion was in aircraft, components, electronic equipment and other miscellaneous items. Of this $1.2 billion, mainly in aircraft components, will be still around on June 30. Surplus real property, total of about $9 billion originally, constitutes the major piece of what is left; $2.6 billion is awaiting disposition and an additional $1.1 billion is under lease.

Steel Plan Proposed

WASHINGTON—In determining allocation of steel under the voluntary agreements authorized by the Taft Act, four strategic fields have been designated for allocations: new domestic freight-car production and repair of rolling stock, petroleum, gas and oil equipment; urgently needed agricultural equipment and certain housing materials.

Rise in Price Of Non-Ferrous Metals is Seen

WASHINGTON—Persistency of rumors indicate upward price changes in the no-ferrous metals markets are forthcoming.

Tin prices, which have been jumping by leaps and bounds, are expected to remain unsettled for another year. No one will hazard a guess on where the price will level off. Only by high-level diplomacy has the U.S. managed to keep the international tin agreements going and the cartel under control. How long the cartel will stay under wraps is anybody's guess. The metal will remain in short supply for at least another year, and will stay under governmental allocation control for that time.

Tension in the lead market, already high, has increased with the report that one of the largest refineries in Mexico shut down because of labor trouble. The supply situation remains very tight, and will probably get tighter as the year progresses. Government specialists estimate a 200,000-ton deficiency for the year.

Persistent rumors have it that lead prices will jump by as much as two cents shortly. There is no public explanation of why an increase is necessary, but it has been reported that production costs have increased materially and that more labor costs are coming.

Copper remains in fair supply, but is not expected to meet demand by some 200,000 tons during 1948. The price is expected to remain unchanged.

Zinc remains in good supply and is expected to meet demands. The price is expected to remain unchanged.

Aluminum pig and sheet remain scarce and the pig shortage is expected to get worse. Deficiency for the year is expected to total about 300,000,000 pounds. There is no indication of a price change. The shortage of sheet is expected to be lessened somewhat when the new ALCOA mill at Davenport, Iowa, goes into partial production next month. Filling the plant pipeline will draw down stocks of pig metal heavily, however.

Danish Fair April 2-11

COPENHAGEN — (McGraw - Hill World News—The second postwar Danish Industrial Fair will be held in Copenhagen, Denmark April 2-11, at the "Forum," largest exhibition hall in Scandinavia.

Marine Jet Engine is shown by Byron Cogswell, Lansing, Mich., inventor, who believes the hydraulic jet engine will replace conventional methods of propelling all types of water craft. He claims the jet pump is four times as efficient as present day pumps. The fin in the front of the tube keeps water from spinning before it hits the propeller, which is incased just behind the collar of the pump

Use of Beryllium-Capped Pistons Increases Life of Plane Engine

WASHINGTON—German and Italian attempts to prolong the life of aviation and automotive engines through the use of Beryllium-capped pistons was not without success, according to a report now available to U. S. industry. Prepared by American industrialists for the Office of Technical Services the report covers the progress of German and Italian beryllium firms from 1939 to 1945.

Production methods for capping aluminum pistons with a one centimeter thick layer of beryllium are described in detail. The bonding temperatures are from 800 to 1,100 degrees centigrade. Laboratory measurements indicate that the resistance to wear of such pistons is very good.

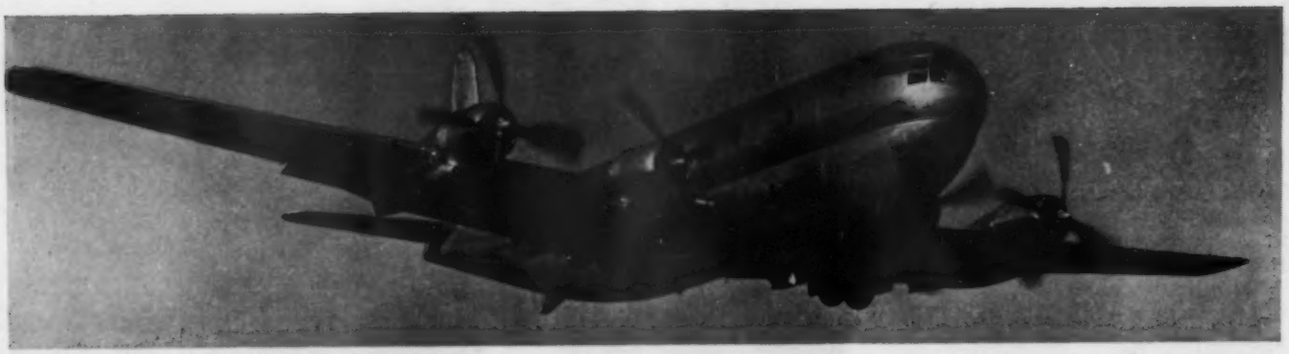
One section of the report detailing the use of beryllium in refactory manufacture, points out that the resulting products are gas tight at 1700 degrees C., and are dense and smooth, resembling fine china. Beryllia crucibles can be used in oven temperatures up to 2300 degrees C. Their melting point is 2350 degrees C.

Also covered are production methods in the manufacture of beryllium oxide, beryllium chloride, beryllium metal flakes, and both heavy and light beryllium alloys.

The 144-page report was prepared by OTS investigator H. A. Sloman and C. B. Sawyer, president, Brush Beryllium Co., of Cleveland. It covers the war-time operations of three German firms, Degussa, Hereeus Vacuumschmelze, and I. G. Farbenindustrie, and the Italian firm of Sappi. Copies of the report (PB-2585; the beryllium industries of Germany and Italy) containing flow sheets, plant layouts, and drawings of equipment are available from OTS, Department of Commerce, Washington 25, D. C. at a cost of $3.75.

U. S. and Britain Vie in Australia

MELBOURNE — (McGraw - Hill World News)—Keen competition between English and American groups intent on producing mining equipment in the Commonwealth is likely to develop as a result of (1) expansion of Ingersoll Rand's service plant to produce a full range of pneumatic mining tools and (2) arrival of the top executive of Ingersoll's principal English rival with intentions to set up a branch plant.



New Boeing YC-97A Stratofreighter, transport counterpart of Boeing B-50 long-range bomber, takes off from Seattle's Boeing Field on its first flight. YC-97A will carry 20 tons of cargo or 134 fully-equipped troops, and has a range and speed similar to B-50. Wings, tail and landing gear of YC-97A and B-50 are interchangeable. Four 3,500-hp. Pratt & Whitney engines power new transport. Design gross weight of transport is 135,000 lb. Wingspan and length are 141 and 110 ft., respectively

Surplus Machines Urged for Europe

ALBANY, N. Y.—Immediate allocation of WAA surplus machine tools to the European Recovery Program was advocated by Charles A. Simmons, president of the Simmons Machine Tool Corp., following his tour of Western Europe.

"We have here in America 200,000 or more machine tools held by WAA or frozen by other branches of the government," the former chief of the Used Tools Division, War Production Board, asserted. "These could be allocated without delay to the cause of ERP, thus saving approximately $2 billion and giving ERP countries badly-needed equipment."

"Government officials will argue that machine tools earmarked for future use are so protected by processing that they can last indefinitely," he said. "Any experienced machine tool man will disagree. It is next to impossible to process a machine tool and keep it in first-class operating condition. Only the outside surfaces and parts are protected. The vital inside parts will rust, or set, and when the time comes to operate it, the machine will be virtually useless."

Lubrication Convention Slated for April 19-21

BUFFALO, N. Y. — The American Society of Lubrication Engineers will hold their third annual convention and exhibit at the Hotel Statler here April 19-21.

Discussions will cover every phase of industrial lubrication, including lubrication engineering, chemistry and physics of lubrication, evaluation of cutting oils, grinding oils, synthetic oils and greases.

This is the first combination All-Lubrication Exhibit and convention.

Auto Firms to Move

MILAN, Italy (McGraw-Hill World News)—The Italian automobile plants of Maserati and Cisitalia of Turin have reached an agreement with the Peron government under which they will transfer their shops to Argentina.

Argentine Ban on Cars Eased

BUENOS AIRES — (McGraw-Hill World News)—The Central Bank of the Argentine Republic has issued a communication stating that exchange permits for the importation of automobiles will only be granted for models of the year 1947 and previous years, provided that applicant can prove that the car was purchased outside of Argentina.

This, in effect, slightly opens the ban on importation of new automobiles or parts which has existed in Argentina for six months.

The new amendment mentioned above will permit private individuals to bring in cars upon fullfillment of the following conditions:

1. That the purchase of the car was made prior to June, 1947 with presentation of corresponding proof.
2. That they were residents in the country of purchase at the time it was affected.
3. That the request be made to the Central Bank at the latest within 30 days of the applicants arrival in this country.

AMA Moves Production Meeting to Detroit

CHICAGO—The American Management Association's Production Conference will be held here May 13-14 at the Palmer House instead of Detroit as originally planned.

Fair Dominated By Soviet Zone

(McGRAW-HILL WORLD NEWS

LEIPZIG, Germany—The Soviet administration in Germany took advantage of the largest trade fair held in this city since the war to put on a display of all possible products made in the Russian-controlled zone.

Around 6,000 manufacturers displayed their articles and approximately 65% of them were from the Soviet zone. At the same time the Russians were making an open offer to buyers to pay the Russian reparations demands from German production.

In many cases exhibitors showed products which are not yet in production, showing that the Russians were hopeful of outclassing the offerings of the Western zones.

The profits of three new companies, Rasno Export, Primo Export and Techno Export, it was learned, are going into the Russian reparations account.

Some firms wondered why their products were shown to the export field inasmuch as their entire output was scheduled to go to Russia. British and American trade observers, however, indicated that there was a marked increase in the availability of goods for the open market.

This is obviously due to Russian desires to obtain as many dollars as possible.

Electroplaters Will Convene In Atlantic City June 28-July 1

ATLANTIC CITY—The annual convention and Industrial Finishing Exposition of the American Electroplaters' Society will be held concurrently here June 28-July 1.

Individuals engaged in the metal finishing and allied industries will attend. Technical sessions will cover recent advances in electroplating.

Hotpoint Opens Rebuilt Plant at Milwaukee

MILWAUKEE — Accelerated shipments of automatic dishwashers and electric water heaters by Hotpoint, Inc., has been made possible by the formal opening here March 2 of that company's new $11 million plant. Schedules call for a peak output of 7,000 units a week before the end of the year.

Title to the plant, operated during the war by Allis-Chalmers for the production of aircraft turbo-superchargers, was taken last November. Conversion was accomplished so rapidly that the first carload of water heaters was shipped before Christmas, according to James J. Nance, president of Hotpoint. Current employment exceeds 500 persons. This figure will be increased at the rate of 300 a month, beginning this month, until peak employment of about 2,000 is reached in September.

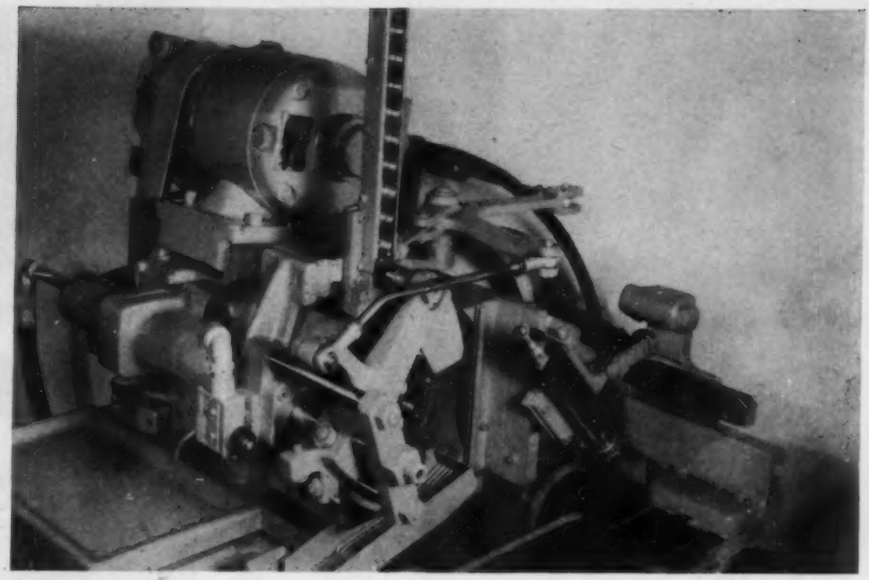
Since acquiring the 475,000 sq. ft. plant, Hotpoint has constructed a 50,000 sq. ft. high-bay addition to house huge presses to be used in the production of parts for dishwashers and water heaters. Included in the new equipment being installed are 54 presses ranging from 50 to 750 tons capacity, fully automatic welders for producing water heater tanks, and conveyor assembly lines for both major products.

Annual capacity is expected to exceed 100,000 automatic dishwashers and 200,000 electric water heaters when the plant is operating on a two-shift, five day week, 50 week year basis. At peak operation 18 carloads of materials will be needed each day to keep the plant in operation, while an equal number will be used to ship completed products.

At the "Get Acquainted" dinner on March 2 sponsored by the Milwaukee Association of Commerce, Mr. Nance described the start of production operations in Milwaukee as a "significant phase in the company's $20 million expansion program" which includes construction of a new electric range plant in Chicago. When all facilities are in full operation later this year, the company's output capacity will be seven times its prewar level.

Motor-Hoist Truck

MOSCOW — (McGraw-Hill World News)—A Soviet-designed self-propelled motor-hoist truck, equipped with a crane boom in addition to hoisting fork and grab bucket, has been put into serial production at the Zolotonoshsky Construction Mechanism Factory of the Soviet Ministry of Railways.



Automatic Internal Grinding . . . A small cup-shaped piece, with a blind bore to be ground, is handled automatically in this Bryant 109 internal grinder. At rest, the pickup arm is withdrawn so the finger at its end has entered the lowest piece in the feed chute. As the wheel withdraws from a grinding cycle, the wheelhead platen traverse actuates a linkage through the adjustable arm at upper right. The air cylinder at front of machine pushes pickoff arm outward and the linkage withdraws a stop pin from the chute and lowers the arm. This puts the stop plate at the end of the arm in line to stop the preceding piece, blown from the chuck, and drop it into the exit chute. The cylinder pulls the arm in to set the piece in the chuck while a button on the yoke at the opposite end of the pickoff arm actuates a switch to close the chuck. The arm is retracted, raised and inserted in the next piece to complete the cycle. Limits of arm travel are set by screws in the yoke at rear of pickoff arm which strikes support arms for the stop bar (also with an adjusting screw) which limits air plunger travel. For additional examples of work-handling devices, see the special report in March 11 A.M.

India to Develop Airplane Factory

NEW DELHI, India (McGraw-Hill World News)—The Indian Dominion government has announced that it intends to develop the Government-owned and supervised Hindustan Aircraft Ltd. factory at Bangalore, South India, into the major supplier of this country's military aviation needs.

Steps are being taken to establish a Design and Development Section to evolve types of aircraft for 100% domestic manufacture.

The factory originally started operations during the war as part of a "build-and-operate" agreement between the Indian government, Indian financiers and The Intercontinent Corp., New York. Later the USAAF took it over and made it into the major Southeast Asia overhaul and maintenance base. Now the shares are held jointly by the Indian government and the Mysore State government.

Present work centers around a contract for the assembly of 15 trainers from parts shipped to India by Percival Aircraft Ltd., Great Britain. A gradual switchover is to be made by the end of this year when the first of 30 similar planes will be manufactured from Indian components, with the exception of engines and instruments.

Present strength of the factory is 3,625 personnel. Of these 16 are British supervisory and administrative personnel and seven are American.

London Exhibit Aug. 26

LONDON — (McGraw-Hill World News)—The Machine Tool and Engineering Exhibition (International), sponsored by the Machine Tool Trades Association, Victoria House, Southampton Row, London, W.C. 1, will be held at Olympia, London from August 26 to September 11, 1948.

Seventy MPH., fastest speed ever attained by any rolling mill is accomplished at the Jones & Loughlin Steel Corp.'s new five-stand tandem cold-strip mill at Aliquippa (Pa.) Works. The machine on right welds into a continuous strip the hot rolled steel about to enter the pickle tanks. Above is a coil being fed into the entry of the tandem mill after coming from the continuous pickle line

Enlighten Foreman on Problems Facing Management, SAM is Told

CHICAGO—More than 500 business and industrial executives, and management engineers from seven states attended the two-day annual spring conference of the Society for the Advancement of Management here March 4-5. Most of the papers presented at the conference dealt with present-day management problems and new developments in management methods.

Importance of the foreman as an integral part of the management team, and the need for keeping him fully informed about all phases of his company's activities, was stressed in an address by Deane S. Hazen, vice president and treasurer of U. S. Slicing Machine Co. "The foreman," Hazen said "should know enough about his company to be entirely convinced of the soundness of its existence and to have confidence in its products and its management."

Mr. Hazen pointed out that "it has been the practice in some shops to keep the foreman too much in the dark in regard to the dollars and cents angles of production, to the extent that in many cases he does not know dollar costs which he creates by the use of his department. Nor does he know how important a part in the whole financial picture is his place in that specific section which is a part of the total cost of production and so its potential profits." He urged that the foreman be informed of:

1. The cost of the product he makes, and what makes up that cost.
2. The cost of operation of his department, both budgeted and actual.
3. The total payroll of his department as a part of a prearranged budget of production.
4. The cost of rework which his department has caused.
5. The cost of scrap caused by his department.
6. The effect of his operation of the department on the cost of the products of his company.

Mr. Hazen recommended that the foreman be provided with some form of incentive so by accomplishing savings in his department, he may benefit personally.

"I believe that there are many people" he said "who will agree with me that many times the foreman has been about the most neglected human element in the industrial organization. Rising from the ranks of workers by selection because of ability to lead others, he has been obliged to some extent to separate himself from his co-workers, but unfortunately he has not been taken into the folds of management except when it has become expedient or necessary. Beyond that knowledge which a foreman has developed through personal experience, he will know primarily only what management is willing to show him by constant advice and expressed confidence in him. His effectiveness will be in direct proportion to the practical aid furnished him by management."

Bids on Surplus Plants Held Up

WASHINGTON—The date for submitting bids for eight Army Ordnance works declared surplus has been held up pending Army and Navy survey of the facilities. War Assets Administration officials believe it will be May before the military has taken what it wants from the plants.

The Ordnance plants which go back on the block after the military has screened them include the Kentucky, Oklahoma, Weldeon Springs, New York, Lake Ontario, Gopher, Badger and Keystone Ordnance works. Two others, the West Virginia and the Plumbrook plants, are also up for sale and can be bid on any time.

Robert C. Stanley Wins Metals' Institute Medal

LONDON—The Institute of Metals' Medal for 1948 has been awarded to Robert Crooks Stanley, chairman and president of the International Nickel Co., of Canada, Ltd.

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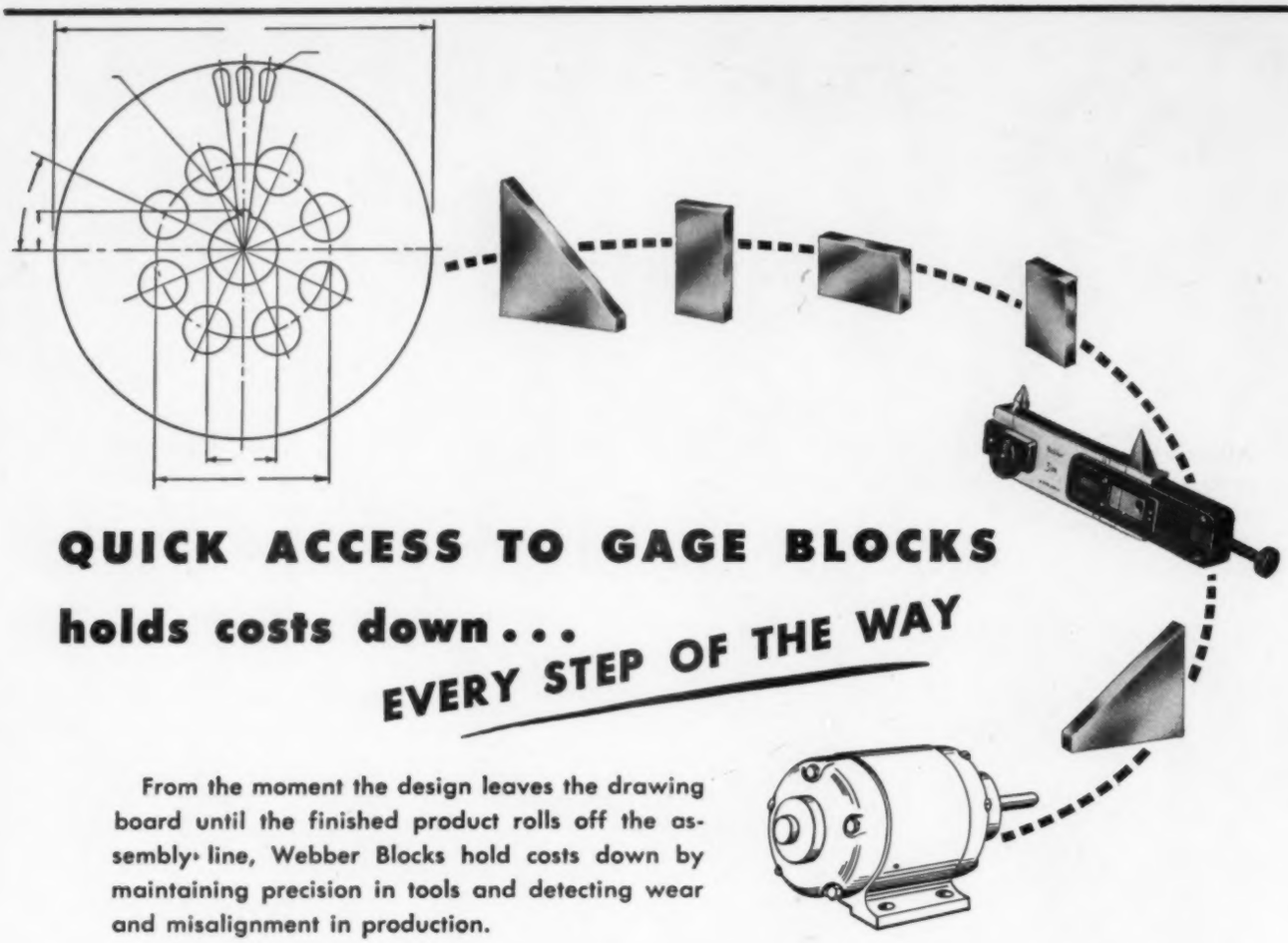

QUICK ACCESS TO GAGE BLOCKS holds costs down . . . EVERY STEP OF THE WAY

From the moment the design leaves the drawing board until the finished product rolls off the assembly line, Webber Blocks hold costs down by maintaining precision in tools and detecting wear and misalignment in production.

Webber blocks enjoy wide application ranging all the way from conventional inspection of dies, tools and gages to direct application when used with Webber fixtures as dividers, height gage, scriber and snap gages.

Gage blocks are available for every linear or angular measuring purpose, individual blocks or in sets to meet your budget requirements. All blocks are finely finished to accuracy measured in millionths.

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Webber
PRECISION
GAGE BLOCKS

Process Sheet for Anodizing Aluminum

CHROMIC ACID METHOD

Although aluminum alloys offer excellent resistance to atmospheric corrosion, they suffer accelerated galvanic attack when coupled with steel parts. In addition, untreated aluminum alloys do not serve as a satisfactory base for organic coatings. The chromic-acid method of anodizing results in an integral coating, which increases resistance to atmospheric as well as galvanic corrosion, and which affords an excellent base for commonly used paints and primers. This method is suitable for all alloys of aluminum except those high in copper (above 5%). Since the coating has a high dielectric value, care should be taken to avoid anodizing aluminum parts at electrical contacts.

DEGREASE

Aluminum parts may be degreased by solvent or vapor degreasers in the same manner as recommended for steel. Precautions must be taken to make sure that the material is dry when it enters the degreaser, and the manufacturer's instructions must be followed to assure that the metal is not attacked by the degreasing solvent.

RINSE

ALKALINE CLEANER

Mild alkali cleaners in the pH range of 9 to 12 are generally used at a temperature of 180 F. Caustic soda or potash should be avoided unless an etch is desired.

RINSE

ANODIZE

Anodizing is normally accomplished in a 3-10% solution of chromic acid. With the temperature maintained between 90 and 100 F., the parts are made the anode and treated for 30 min. Higher voltages permit shortening the time, but result in a loss of operating efficiencies. The color of a chromic-acid anodic film varies from iridescent to dull gray depending upon material, time, voltage and temperature.

RINSE

RINSE (HOT)

The double rinse is required to avoid staining of the anodized surface. But for parts which are to be painted, staining is an asset provided subsequent paint coats have adequate hiding power.

DRY

PRECISION MASS PRODUCTION ...GETS RESULTS!

More GOOD CASTINGS —in less time... at less cost!

A specific example of good steel casting is the (censored) section which meets *pin-point* inspection on all vital surfaces before and after machining. By being cast extremely close to the final finish—less than one cubic inch of material *over the entire casting* is lost in machining! Regardless of these and other rigid requirements that must be met, Unitcast has shipped over 120,000 castings to date—at an average of 15,000 castings per month!

Unitcast Corporation, Toledo 9, Ohio.

**Unusual as it may seem to use a censored illustration, the story is too valuable to omit. We are proud to relate in the customer's own words that the tremendous success of his business is primarily due to his good fortune in finding in UNITCASTINGS, a casting that could meet all his specifications and thus enable him to outstrip his competition.*

UNITCAST CORPORATION

ALLOY AND CARBON ELECTRIC STEEL CASTINGS

Decimal Equivalents of Various Gages

COURTESY COPPER & BRASS RESEARCH ASSOCIATION

(Designation of thicknesses in decimals of an inch, instead of gage numbers, is recommended)

Gage No.	American or Brown & Sharpe's (1) A. W. G. or B. & S.	Birmingham or Stubs' (2) B. W. G.	Washburn & Moen (3) S. W. G.(4)	British Standard (5) S. W. G.	London or Old English (6)	United States Standard (7)	Manufacturers' Standard for Sheet Steel (8)	Gage No
0000000			.4900	.500		.500		0000000
000000	.5800		.4615	.464		.469		000000
00000	.5165		.4305	.432		.438		00000
0000	.4600	.454	.3938	.400	.454	.406		0000
000	.4096	.425	.3625	.372	.425	.375		000
00	.3648	.380	.3310	.348	.380	.344		00
0	.3249	.340	.3065	.324	.340	.312		0
1	.2893	.300	.2830	.300	.300	.281		1
2	.2576	.284	.2625	.276	.284	.266		2
3	.2294	.259	.2437	.252	.259	.250	.2391	3
4	.2043	.238	.2253	.232	.238	.234	.2242	4
5	.1819	.220	.2070	.212	.220	.219	.2092	5
6	.1620	.203	.1920	.192	.203	.203	.1943	6
7	.1443	.180	.1770	.176	.180	.188	.1793	7
8	.1285	.165	.1620	.160	.165	.172	.1644	8
9	.1144	.148	.1483	.144	.148	.156	.1495	9
10	.1019	.134	.1350	.128	.134	.141	.1345	10
11	.0907	.120	.1205	.116	.120	.125	.1196	11
12	.0808	.109	.1055	.104	.109	.109	.1046	12
13	.0720	.095	.0915	.092	.095	.0938	.0897	13
14	.0641	.083	.0800	.080	.083	.0781	.0747	14
15	.0571	.072	.0720	.072	.072	.0703	.0673	15
16	.0508	.065	.0625	.064	.065	.0625	.0598	16
17	.0453	.058	.0540	.056	.058	.0562	.0538	17
18	.0403	.049	.0475	.048	.049	.0500	.0478	18
19	.0359	.042	.0410	.040	.042	.0438	.0418	19
20	.0320	.035	.0348	.036	.035	.0375	.0359	20
21	.0285	.032	.0317	.032	.0315	.0344	.0329	21
22	.0253	.028	.0286	.028	.0295	.0312	.0299	22
23	.0226	.025	.0258	.024	.0270	.0281	.0269	23
24	.0201	.022	.0230	.022	.0250	.0250	.0239	24
25	.0179	.020	.0204	.020	.0230	.0219	.0209	25
26	.0159	.018	.0181	.018	.0205	.0188	.0179	26
27	.0142	.016	.0173	.0164	.0188	.0172	.0164	27
28	.0126	.014	.0162	.0148	.0165	.0156	.0149	28
29	.0113	.013	.0150	.0136	.0155	.0141	.0135	29
30	.0100	.012	.0140	.0124	.0138	.0125	.0120	30
31	.0089	.010	.0132	.0116	.0123	.0109	.0105	31
32	.0080	.009	.0128	.0108	.0113	.0102	.0097	32
33	.0071	.008	.0118	.0100	.0103	.00938	.0090	33
34	.0063	.007	.0104	.0092	.0095	.00859	.0082	34
35	.0056	.005	.0095	.0084	.0090	.00781	.0075	35
36	.0050	.004	.0090	.0076	.0075	.00703	.0067	36
37	.0045		.0085	.0068	.0065	.00664	.0064	37
38	.0040		.0080	.0060	.0058	.00625	.0060	38
39	.0035		.0075	.0052	.0050			39
40	.0031		.0070	.0048	.0045			40
41	.0028		.0066	.0044				41
42	.0025		.0062	.0040				42
43	.0022		.0060	.0036				43
44	.0020		.0058	.0032				44
45	.0018		.0055	.0028				45
46	.0016		.0052	.0024				46
47	.0014		.0050	.0020				47
48	.0012		.0048	.0016				48
49	.0011		.0046	.0012				49
50	.0010		.0044	.0010				50

NOTES

(1) **American or Brown & Sharpe's Gage.** Formerly commonly applied to copper and copper alloys in flat rolled products and wire; also to aluminum and resistance wires

(2) **Birmingham or Stubs' Gage.** Formerly commonly applied to copper and copper alloy seamless tubes; sometimes used for sheet copper for tanks; also applied to strip steel and steel and aluminum tubes. Also employed to a limited extent in Great Britain.

(3) **Washburn & Moen Gage.** Also called U. S. Steel Wire Gage, Roebling, and American Steel and Wire Co.'s Gage. Bare copper piano wire. Usually employed in the United States for steel and iron wire.

(4) The use of the abbreviation "Steel W. G." instead of "S.W.G." is suggested to avoid confusion with British Standard Wire Gage.

(5) **British Standard Gage.** Also known as New British Standard, English Legal Standard, or Imperial Wire Gage. Legal standard of Great Britain by order of Council, August 23, 1883.

(6) **London or Old English Gage.** Sometimes used for specifying wire sizes. Same as B. W. G. for all gage numbers under 20.

(7) **United States Standard Gage.** Established by Act of Congress March 3, 1893, for sheet and plate iron and steel. Formerly the legal standard for duties. The values in this column have been adjusted to three significant figures.

(8) **Manufacturers' Standard Gage for Sheet Steel.** Recently adopted by the American Iron and Steel Institute, under the name "Manufacturers' Standard", as a modification of U. S. Standard gage, to reflect present average unit weights of sheet steel.

Faster Cutting, Longer Tool-Life, Reported for the New Sun Cutting Fluids Containing No Animal or Vegetable Fatty Oils

Since Sun recently announced the new grades of Sunicut with Petrofac, favorable performance reports have been coming in on practically every kind of metal-cutting job.

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SUN INDUSTRIAL PRODUCTS

SUNOCO

Process Sheet for Decorative Nickel Plating

Nickel plating is used primarily to protect metallic objects from corrosion. General practice is to nickel plate directly on the base metal or to use a composite coating of copper and nickel. In both processes, the nickel plate is followed by the deposition of a thin coating of chromium, which supplies the abrasion- and tarnish-resistant qualities.

Investigations have shown that the protective value of the nickel deposit is directly proportional to the thickness applied, and the modern trend is toward the use of heavier, more protective coatings. The following chart traces the steps recommended for the application of bright nickel plate to steel, zinc and brass surfaces.

POLISH

The degree of polishing and buffing depends upon the material being plated and the luster desired. Generally, nonferrous parts are completely buffed at this stage. Steel items, and others requiring a very high luster, may be buffed after deposition of the copper or the nickel plate.

DEGREASE

RINSE

ELECTROCLEAN

Hot alkaline cleaners, in which the work is made the cathode and then the anode, are in general use.

RINSE

ACID DIP

Dilute solutions of hydrochloric or sulphuric acid are recommended at room temperature. Over-etching must be avoided.

RINSE

Brass ***Steel or Zinc***

NICKEL PLATE | **NICKEL PLATE** | **COPPER PLATE***

RINSE

ACID DIP

RINSE

NICKEL PLATE

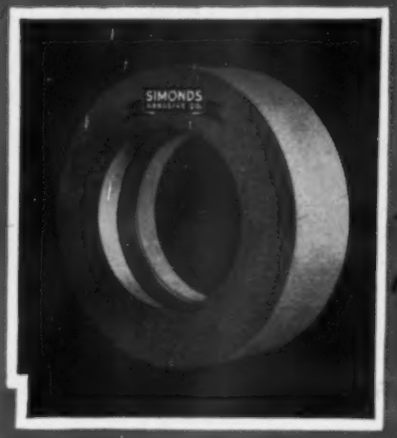
Nickel may be deposited directly on the base metal or on previous deposits of copper. The composition and operating conditions of the bath will vary with the metal being plated. Items which are buffed after copper plating, must be returned to the cleaning cycle before being re-entered in the plating sequence. For the treatment of buffed nickel plate prior to chromium plating, see the Reference Book Sheet pertaining to decorative chromium plating.

**Details of the copper plate bath will be covered in a future Reference Book Sheet on copper plating.*

the grinding job

Centerless grinding seamless steel tubing 2½" outside diameter, ⅛" wall thickness, 18" long on a Landis Tool Company No. 12 Centerless Grinder, through feed, 15 micro-inch-finish. Cool grinding action is essential to prevent heating and distortion of the piece.

the wheel



Borolon Vitrified centerless grinding wheel A60-L6-V1, size 20" x 6" x 12". Selected for cool, fast grinding combined with long wheel life . . . ideal for production runs. Grain and grade combinations can be varied to meet the requirement of any specific circumstance of use

Borolon ALUMINUM OXIDE — *Electrolon* SILICON CARBIDE

SIMONDS ABRASIVE CO.

PHILADELPHIA, PA.

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Complete line includes every shape and size.

Abrasive Grains

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Available Everywhere

SIMONDS ABRASIVE CO. GRINDING WHEELS

where to get it

Simonds Abrasive Distributors in all principal industrial centers of the U. S. and many foreign countries carry stocks and can advise on grinding wheel selection. Write today for Technical Manual on Centerless Grinding. Also for name of nearest distributor.

SIMONDS ABRASIVE CO.
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For over 50 years Simonds Abrasive Company has been a major manufacturer of grinding wheels and abrasive products exclusively. From the crude abrasive produced by Simonds Canada Abrasive Company Ltd., to the finished wheels manufactured in our modern Philadelphia plant, complete quality control governs every phase of processing and manufacture. That is why you can count on top wheel performance on every grinding job from roughing to finishing—efficient wheel action consistently repeated each time you buy Simonds Abrasive Company grinding wheels.

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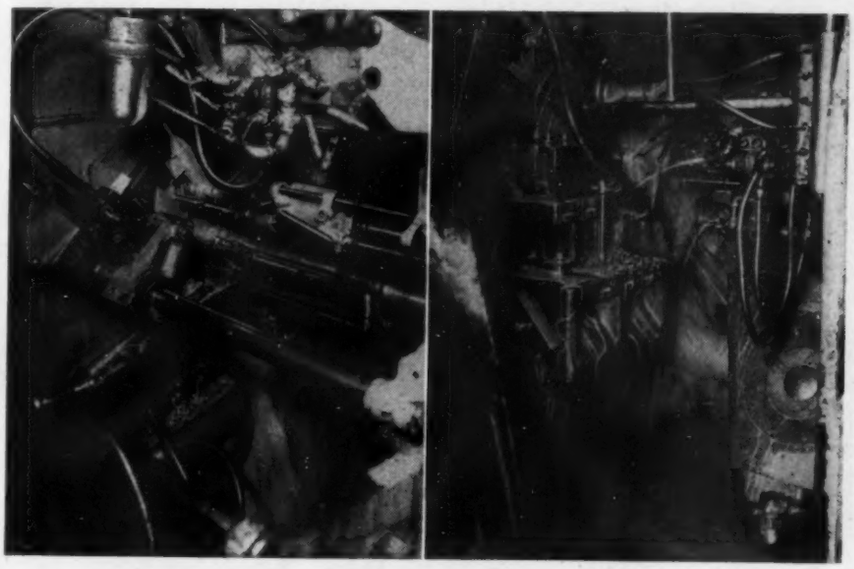
Shop Equipment News



Two applications of Antisep All Purpose Base on automatic screw machines. The base, mixed with 15 parts of water, has been used without overheating on setups for steel on which carbide tools were employed

Houghton Antisep All Purpose Base Suits Cutting, Forming, Automatics

A cutting-oil base which can be diluted with either oil or water, Antisep All Purpose Base, has been developed by E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa. The base is high in both sulphur and saponifiable content and is said to be suitable for more than 90% of metal cutting and forming operations, including general machining, automatic screw machines, stamping, and drawing.

Research on the new base has been followed by more than a year of testing under all types of operating conditions in metalworking plants. Chemical properties are not changed by dilution with water. A 10% water solution tested on the Faville-Levally film-strength machine carried a full load of 4500 lb. with a torque of 45 lb. ft.

Testing on automatics of various types is said to have shown no ill effects to any part of the machines, even at high dilution with water. It has been used with success on automatics where only straight cutting oils had been previously recommended.

As a drawing compound, Antisep All Purpose Base can be used straight, diluted with oil or water, or diluted with a combination of both, depending on the severity of the operation.

Advantages of the new base are said to include: High refrigerating qualities which allow high machine feeds and speeds with better finish, cool work, long tool life, and no "blue" rejects. Satisfactory lubricating qualities, even with water, protect bearings and spindles of automatics. High rust-preventive properties prevent corrosion, staining, or pitting of parts. Antiseptic treatment prevents promotion of the growth of bacteria and keeps the oil from turning rancid in machines or storage. Because of emulsibility with water, it is easily cleaned from the work.

Typical parts produced on automatics with the new Houghton oil

The broad applications of the new base are said to provide a single, concentrated product reducing inventory, storage, and handling.

One case history in a plant with two types of automatics reports that difficulties were encountered with a setup including two forming tools, one turning tool, one drill and a cutoff tool using various straight cutting oils. Slowing the machines down and using lighter cuts did not prevent blue work. Introduction of Antisep All Purpose Base is said to have permitted stepping machine speeds and feeds up to capacity, yet produced work cool enough to handle and increased tool life.

Kit for Handicapped Persons Offers Vise Wrench, Pliers

A kit of holding devices, designed for handicapped persons is offered by Lapeer Mfg. Co., 2906 W. Grand Blvd., Detroit, Mich. A lever locks and releases working tool. Gripping pressure is adjustable.

Kit includes three devices, a vise wrench, 7 in. long that can hold any shape, a Knu-Vise pliers, with screwdriver slot on spindle to facilitate adjustment of pressure for accommodating varying thicknesses, and a Flexi-Grip pliers that requires no presetting. Spindle automatically adjusts to varying thicknesses held to $\frac{3}{8}$ in. Adapter is also supplied for use on any standard artificial arm, and with a wingscrew can be made to hold desired tool.

Pant-O-Jector Staging Fixture Checks by Optical Projection

Gaging turbine blades by optical projection on a production basis is introduced by Engineers Specialty Div., Universal Engraving & Colorplate Co., Inc., 980 Ellicott St., Buffalo 8, N. Y. Contour measuring projectors equipped with suitable staging fixtures are said to offer an accurate means of gaging, free of ordinary human errors and not demanding special training of operators. Called the Pant-O-Jector,* it is a staging fixture that can be applied to the table of a standard optical comparator. It is capable of checking both sides simultaneously, or either side separately as may be desired, of blades up to 3-in. chordal width and 6-in. airfoil length measured from tip section of blade to gaging section nearest to root. With special arms and a lift ram, longer and wider blades can also be checked.

Yoke *Y*, illustrated, supports cross-beam *C* and is moved along the bed by turning handwheel *K*. The cross-beam supports two sleeves, S_1 and S_2. These are rigid but are free to move along the cross-beam on preloaded balls running in double V raceways. Each sleeve moves independently, but is drawn toward the other by a dead weight encased in *W*. Gaging arms A_1 and A_2 are fastened to the sleeves and carry rollers R_1 and R_2 aligned to each other in all planes with respect to the cross-arms.

On the opposite side of the sleeves, brackets M_1 and M_2 support glass reticles G_1 and G_2. These are positioned so they overlap but do not touch each other. Circles, exactly the same diameter as the rollers, are scribed on the reticles and are in the projection path of the contour-measuring projector, so by means of the 10X lens system, both circles are projected on the screen simultaneously. As the rollers and scribed circles are of the same diameter and are attached to the same moving elements, any object can be traced accurately by means of coordinate movements of the gaging unit.

For inspection, the blade is held firmly in clamping jaws made to suit the root section, and the fixture correctly locates the blade with respect to the center of gravity; therefore, the blade is acceptable only if the periphery of the projected circles remains adjacent to the profile on the chart as the rollers are traversed across the blade.

Vertical indexing of the blade is obtained by a gear-driven jack screw and a precision spacer bar provided with holes to be engaged by a plunger. Intermediate gaging positions for analytical work can be obtained by using standard gage blocks and a dial indicator.

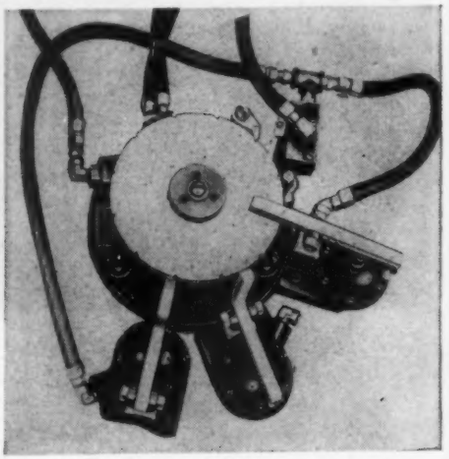
In projecting the first profile, it may be found that the eyes do not follow the master profile of the chart-gage. A group of knobs control adjustment along the horizontal and vertical axis and also for rotation of the blade. By these adjustments the blade can be moved into proper relation to the corresponding section on the chart-gage screen. Proper coordination of the blade holding unit and the chart-gage is made by means of a set master.

For record purposes, photographs may be made of the blade sections as seen on the chart-gage screen. Sensitized photographic paper is held against the chart-gage, and, using the light system of the comparator, the paper is exposed along the path taken by a special eye as the profile is checked in the usual manner.

* Patents Pending

Gaging element, showing arrangement as set up for checking a turbine blade

Both sides of a turbine blade are being inspected in this setup in which two different types of eye are used



Dial Feed Tables by A. K. Allen Operate Through 3-Way Air Valve

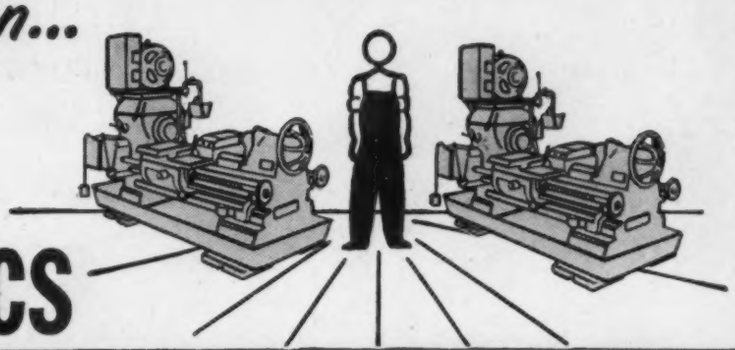
The A. K. Allen Co., 3011 Ft. Hamilton Parkway, Brooklyn 18, N. Y., introduces the Models 11A and 11B dial feed tables which have 11-in. dia. index plate and 14-in. dia. base, and also the Models 725A and 725B, having 7¼-in. dia. index plate and 9-in. dia. base.

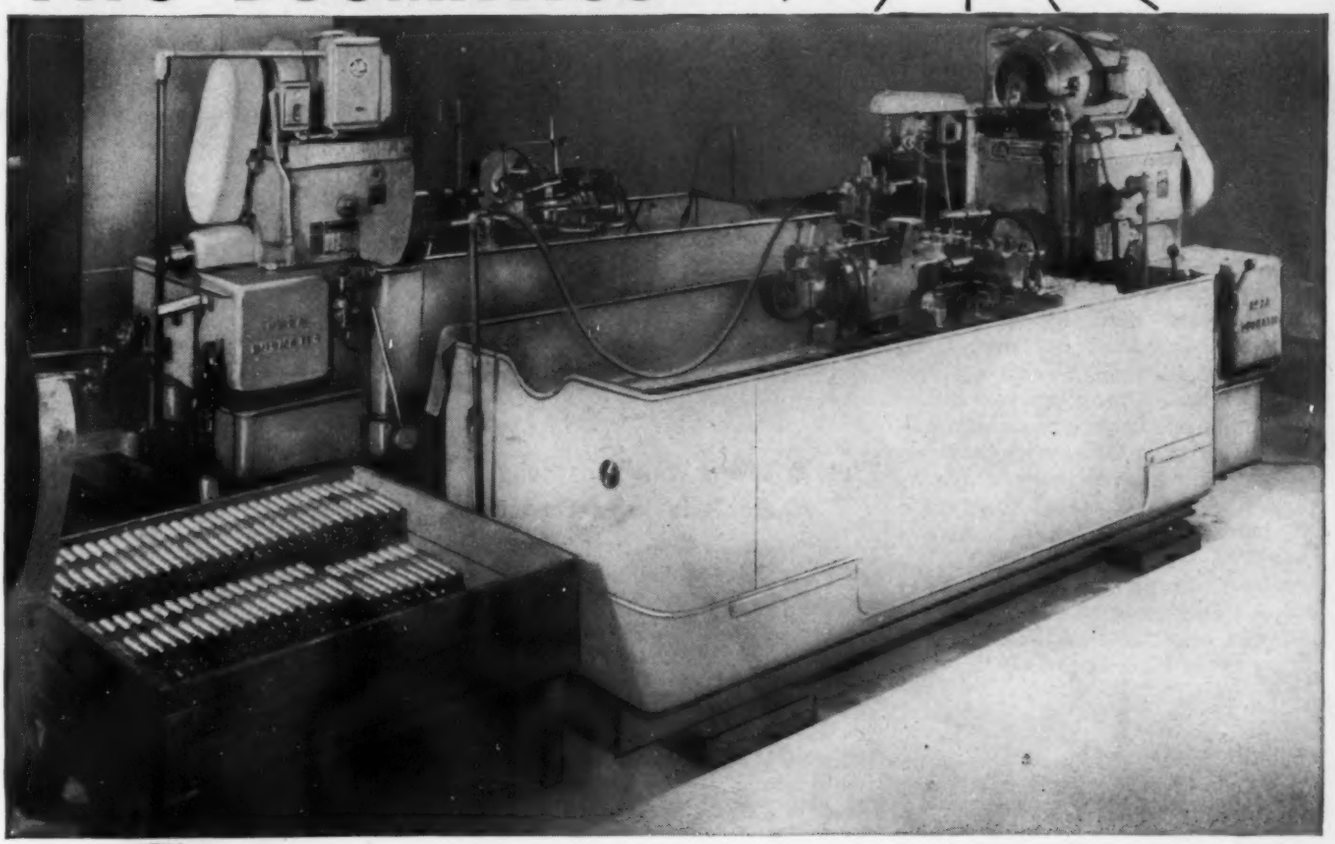
The table operates by means of compressed air through a 3-way air valve, moving a hardened and lapped piston to operate the pawl arm. The pawl indexes the table and locks it in the indexed position until the valve is released, allowing a spring to return the pawl ready for the next indexing.

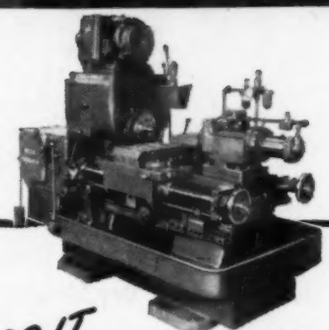
Model B is an adaptation of Model A, and uses a special control valve for automatic self-indexing. By turning a screw, speed is adjustable from one indexing each ½ sec., to one each 10 sec. Table is locked to position between indexings. Recommended where no mechanical motion is available.

75% Greater Production...

ONE-MAN OPERATES TWO DUOMATICS







DO IT with a DUOMATIC

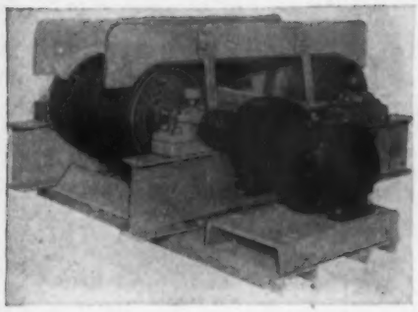
Truly automatic, the Duomatics are really two lathes in one. Two tool carriages operate singly or simultaneously to perform intricate turning and facing operations. And there are no expensive, time-consuming cams to change. Jobs are set up and run in a minimum of time.

The J. I. Case Company, famed farm equipment manufacturers, cites a specific production run of several jobs performed on its Lodge & Shipley Duomatic Lathes to prove this statement. In producing 1⅛" diameter snapping roll shafts for Case's famous corn picker, two Duomatics are used. Operated by one man, these automatic lathes turn and face cold rolled bar stock to ".002" tolerance" at a production rate "75% greater" than former lathes!

Such records are commonplace with Lodge & Shipley's famous Duomatics . . . 2A or 3A models. Lodge & Shipley Engineers will gladly show you other case histories of 2-A Duomatics (for smaller work) and 3-A Duomatics (for larger jobs). They will prove that Duomatics can do your repetitive jobs . . . far faster . . . with more profit.

THE **Lodge & Shipley** COMPANY

MACHINE TOOL DIVISION • 3055 COLERAIN
SPECIAL PRODUCTS DIVISION • 800 EVANS ST.
CINCINNATI 25, OHIO



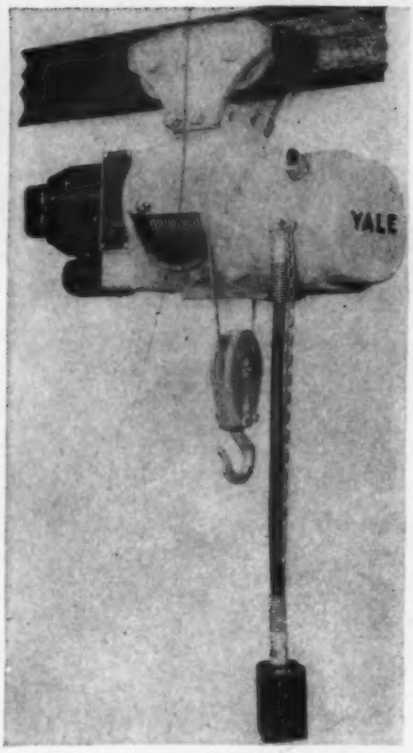
Horizontal, Inclined Separators Remove Tramp Iron from Materials

A line of self-contained horizontal and inclined magnetic-pulley-type separators has been introduced by Dings Magnetic Separator Co., 4740 W. McGeogh Ave., Milwaukee 14, Wis. Each unit incorporates an Alnico magnetic Perma-Pulley, an idler pulley, endless belt and drive.

Units are designed to provide automatic removal of tramp iron from such materials as coal, plastics, ore, chemicals and rock, where either protection of machinery or purification of product is desired. Intended for installation at discharge of chutes and conveyor belts, they can be fed by hand or by material handling devices.

Models range in width from 12 to 60 in., and come with belts of any desired length. Perma-Pulley diameters range from 12 to 30 in.

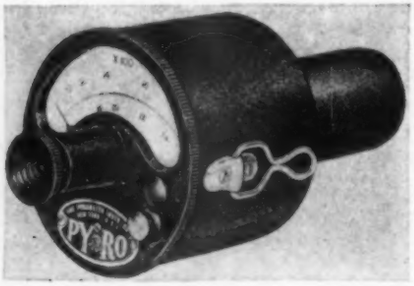
MODEL 11D50 Dustkop for operation on 25-cycle power is added to the line of self-contained dust collectors by Aget-Detroit Co., Ann Arbor, Mich. A special motor mounting for an overdrive is used to maintain normal fan speed. This permits development of over 1300 cfm. suction on a 6-in. dia. inlet with 3-in. water lift



Yale & Towne Wire Rope Hoist Available in Three Capacities

A line of low-capacity, wire-rope hoists, known as the Load King, has been developed by Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia 24, Pa. Available in ¼-, ½-, and 1-ton capacities, the frame of the portable hoist is a one-piece, ribbed-steel casting, constructed for use with lug, plain trolley, motor trolley, or winch-type mounting.

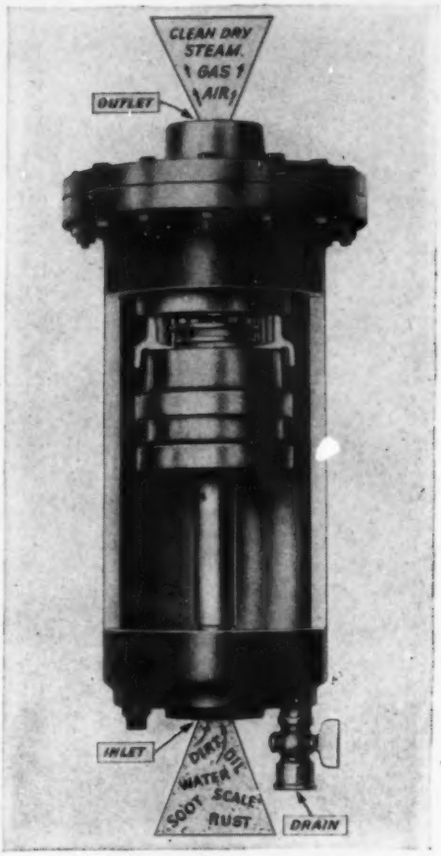
Hoist is equipped with a drum with machine-cut grooves for guiding the cable as it winds. The specially designed reversing-type motor is rated to operate under constant service with full load.



Automatic Radiation Pyrometer Requires No Outside Connections

The Pyro radiation pyrometer designed to determine temperatures above 1000 F. by thermo-electric principles, is introduced by Pyrometer Instrument Co., 103 Lafayette St., New York, N. Y. Instrument is self-contained and requires no outside connections, lead wires, batteries or other accessories.

Radiation is automatic. The instrument is sighted at the object being measured, and the temperature is read on the direct-reading scale provided. An electro-motive force is set up by the sensitive vacuum thermocouple, forcing a galvanometer calibrated in degrees to give the temperature reading. A locking device holds the pointer at the reading obtained until it is released by a button. Unit is constructed in a steel housing which is said to eliminate external magnetic and electrical influences.



Model E Air Separator by CMD Delivers Clean, Dry Steam, Gas

The model E air separator for delivering clean, dry steam, gas and air, is offered by The Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.

Separators are said not to require any attention other than draining off condensation that accumulates in the chamber. Model E has a maximum rated capacity of 250 cfm., a 2-in. dia., is 15-in. high, and has a 1½-in. standard pipe connection. Unit is said to have no moving parts, screens, filters, felt or wool.

Gears & Involute Splines
Included Angle Splines
Cams and Over-Running Clutches
Sliding Clutches
Special Forms
Toothed Parts
Special Forms
Ratchets
Straight Sided Splines
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You can cut
SHAPES LIKE THESE
faster, more accurately, at lower cost
ON THE MICHIGAN
SHEAR-SPEED*
SHAPER
a gear shaper, a contour former,
an external broaching machine
Ask for Bulletin No. 1800-47
MICHIGAN TOOL CO.
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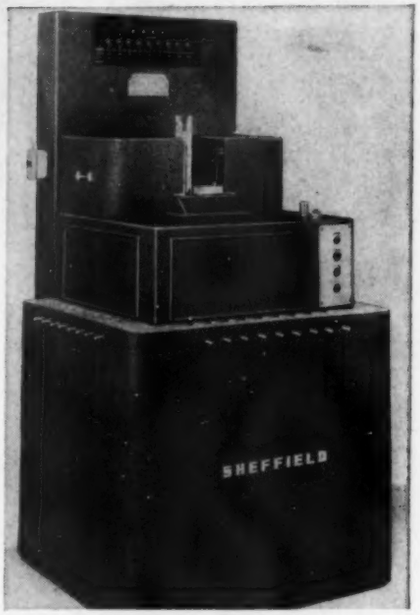
*TRADE MARK

Torch for Soldering, Brazing Burns Butane or Propane Gas

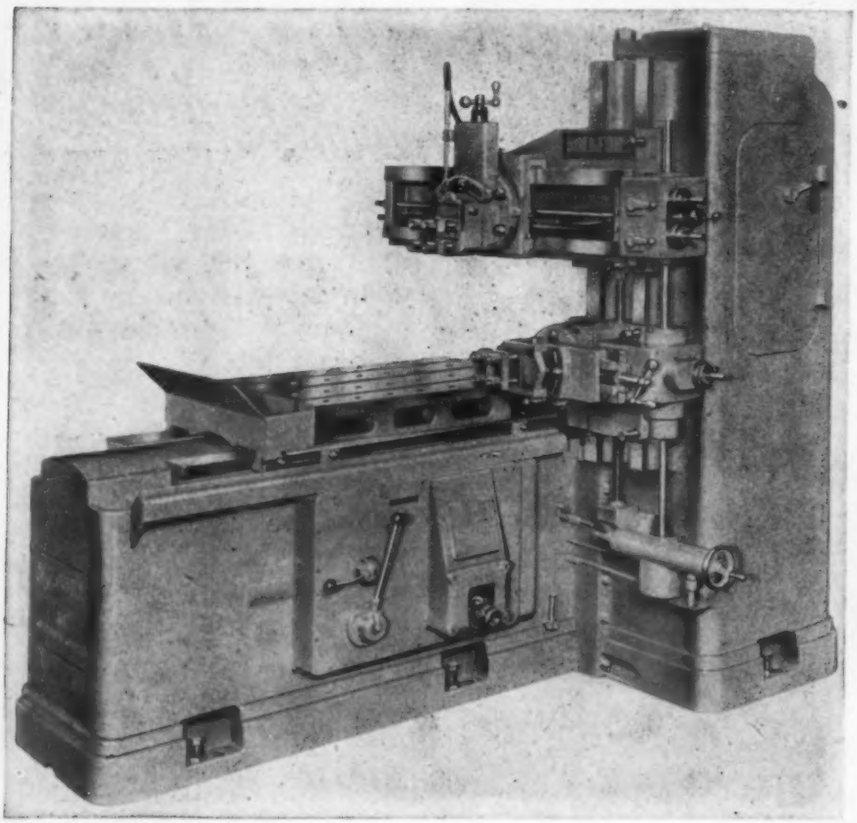
Sully Engineering Ltd., 7416 Melrose Ave., Los Angeles, Calif., announces the Crown torch, designed for all soldering, brazing, and heat operations. Unit is self-contained and burns butane or propane gas. Torch is 12 in. long, weighs 2½ lb. when full, and has no large tanks, or hoses. Fingertip control of flame size and an all-in-one tip are featured. Torch is said to give over 8 hours of burning time and a 3800 F. operating flame with high BTU efficiency.

Bell Aircraft Prime Mover Operated by 3-hp. Engine

A materials-handling device, with a 1000-lb. capacity and the ability to climb a 20% grade with full load, is offered by Bell Aircraft Corp., P. O. Box 1, Buffalo 5, N. Y. Called the Prime Mover, the three-wheeled machine is powered by a 3-hp. air cooled engine. Unit can be equipped with a bucket or steel and wood platform deck. Transmission, clutch and gears are enclosed and no belts are used to transmit power. Unit is 35 in. high, 63 in. long, and 31½ in. wide, and is said to operate for eight hours on three gallons of fuel.

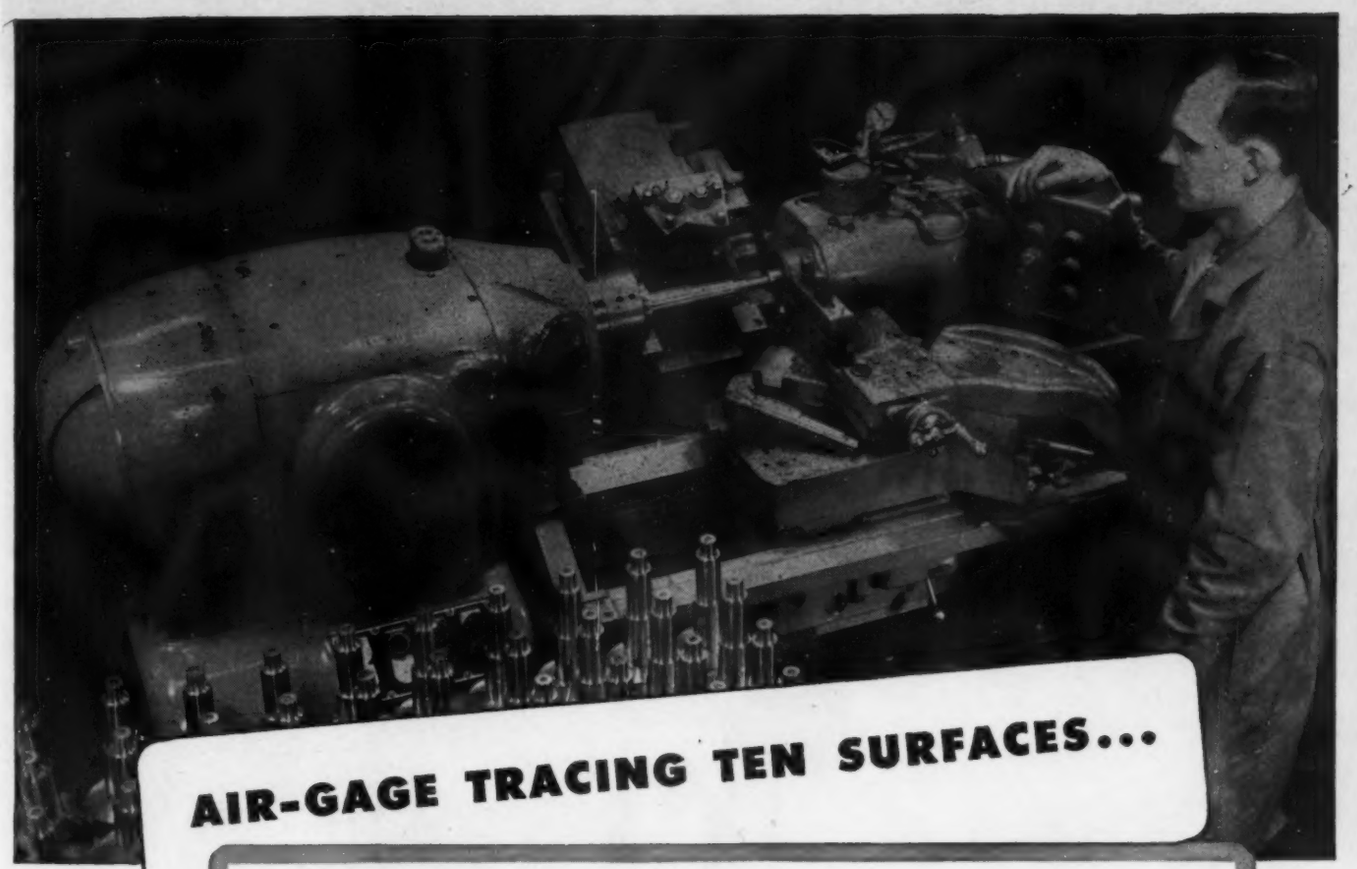


GAGING MACHINE that automatically segregates lapped-finish parts into 27 classifications without marring, is made by Sheffield Corp., Dayton 1, Ohio. Hermetically sealed valve plates about the size of a half-dollar and twice as thick, are hand fed into a vertical loading stack. Plates are checked and segregated into three 0.0004 in. major classifications of diameter. Classifications are further broken down into eight acceptable types and three rejected types



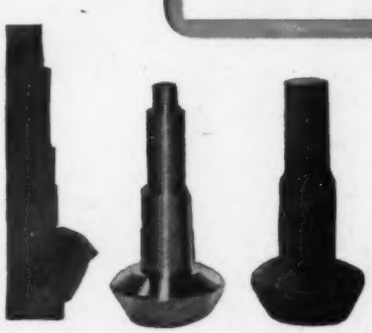
OPENSIDE SHAPER, the Hy-Draulic 36-in. is redesigned by Rockford Machine Co., Rockford, Ill., to include two new advantages. Range of application is increased by a heavier column and rail and a redesigned sidehead. Setup and operation are said to be improved by dual controls for table operation from either side. Safety devices are included in the stop- and start-lever assemblies. Power rail elevation is available as extra equipment. Other advantages are fast cutting and return strokes with infinite speed selection

CARBON-ARC torch for brazing, soldering and supplying heat for light forgings, and other operations, is offered by Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa. Torch is supplied with two 10-ft. welding cable leads attached, one pair ¼x6-in. electrodes, and one pair ⅜x6-in. carbon electrodes. Leads have bayonet attachment plugs to fit the Westinghouse WT Midget Marvel and the limited-input welders



AIR-GAGE TRACING TEN SURFACES...

MONA-MATIC MACHINING TIME... *72 seconds per piece*



Template (at left) controls the Air-Gage Tracer mechanism to make a continuous single-point cut on the rough forging (at right) producing a finished bevel gear blank (center) in two operations. Tolerance: .005".

The unbeatable combination that makes this production possible is the Monarch Mona-Matic, equipped with rear tool slide and the Monarch Air-Gage Tracer.

The Mona-Matic machining cycle is fully automatic. One operator can service a battery of two machines, *easily*. While the single-point Air-Gage Tracer-controlled tool on the front slide makes a continuous cut to finish the principal diameters, the rear slide traverses in to perform the necking, grooving and forming cuts. That way no time is lost in needless second operations—and there are a minimum of cutting tools to synchronize or resharpen.

The end result is more production—and finer finishes—at less cost. In other words, to use Monarch's oft-quoted maxim, "*Peak Production at a Profit*". May we show you how the Monarch Mona-Matic with Air-Gage Tracer can make that statement more than just a slogan—in your shop?

THE MONARCH MACHINE TOOL CO., Sidney, Ohio

ACCURACY · ECONOMY · LONG LIFE

Monarch TURNING MACHINES

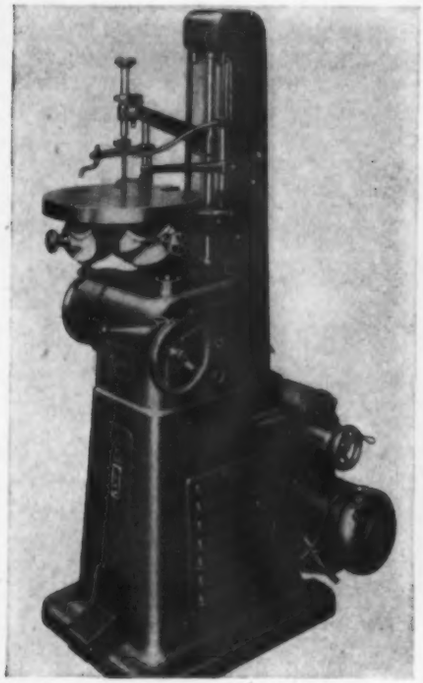
FOR A GOOD TURN *FASTER* —— TURN TO MONARCH

Carbide-Tipped Cutting Tools Embody Four Cutting Points

A standard line of carbide-tipped circular cutting tools feature four individual cutting points stationed around the outer edge of the tool surface. Made by the R. F. Cook Mfg. Co., Cuyahoga Falls, Ohio, tools are available in various sizes. The diamond-ground finish is said to assure better part finish.

Mobile Hydraulic Crane Unit Lifts, Carries, to 6000 lb.

A mobile hydraulic unit, the Lugger crane, has been developed by Day-Smith Hydraulic Crane Corp., Camp Hill, Pa. Crane lifts and carries to 6000 lb. Ten feet of vertical boom travel, with a cable travel of 16 ft., is provided as well as an 18½-ft. max. clearance under the hook. All movements are controlled from the driver's seat.



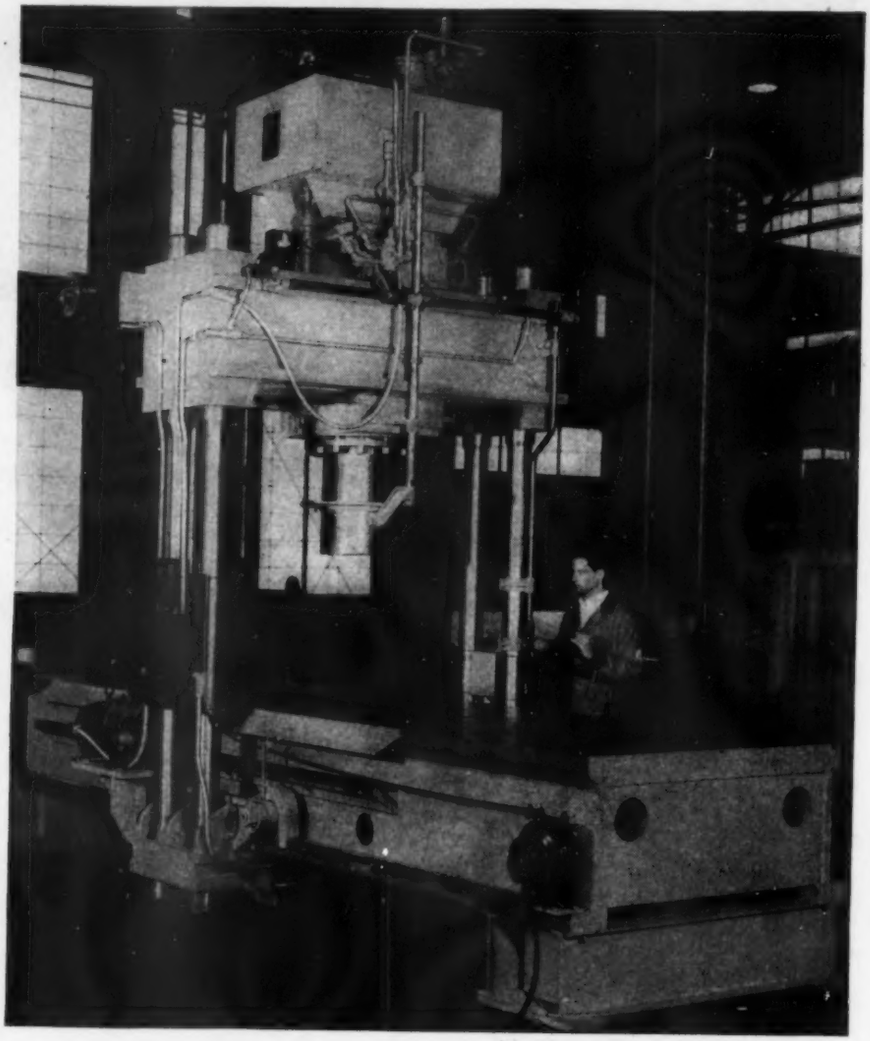
Williams Die-Making Machine Files Gages, Cams, Templets

A machine for filing of dies, gages, cams, templets and machine parts is known as the Williams die-making machine, and is offered by Connecticut Tool and Engineering Co., 544 Iranistan Ave., Bridgeport 4, Conn.

The table is in alignment with file holders at all times, and can be tilted in any direction by the use of a cradle and rocking arrangement which is calibrated to a 10 min. reading on verniers. A rigid main spindle transmits all forces from crank drive to the body. The counterbalanced crank mechanism and moving parts are bath lubricated. The file stroke can be set and locked from 0 to 5 in. in length.

The machine is said to compensate for the run out of files by the side movement of the upper movable arm. The lower stationary arm and upper movable arm which support the files and saws are mounted on a shaft rigidly held by bushings above and below the work table.

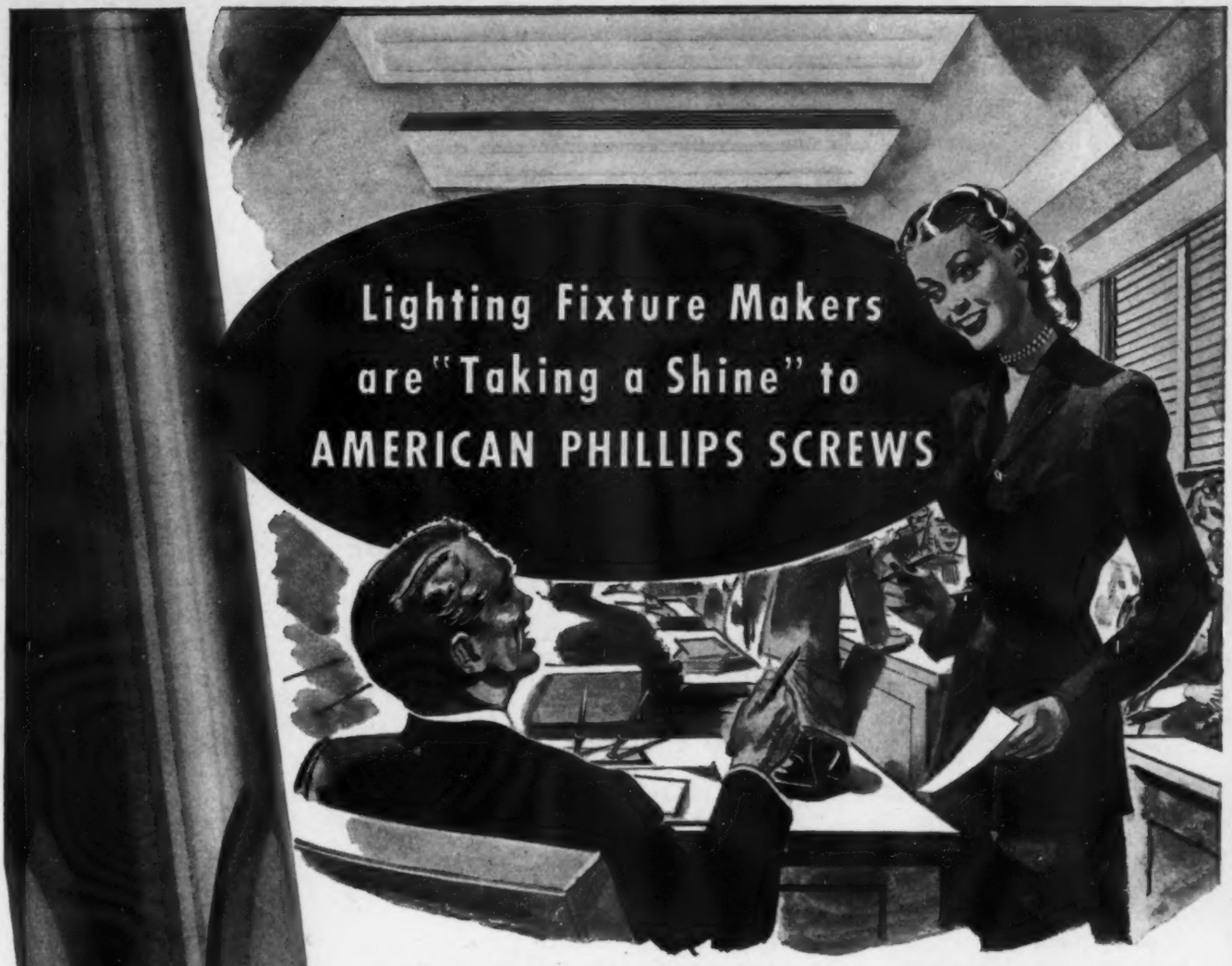
Machine will take files from 4 to 10 in. long, and has an infinite speed range. Size of throat is 10¾ in. Machine makes 75 to 300 strokes per min. Over-all dimensions are 30 x 42 x 64 in.



Ram of Hydraulic Straightening Press Moves Parallel, Perpendicular to Bed

The Hydraulic Press Mfg. Co., Mount Gilead, Ohio, announces a 200-ton hydraulic press for straightening weldments, castings and other large area parts. Maximum pressure can be applied at any point within a 120x38-in. area of the bed. Pressure ram is movable in a horizontal plane along bed and also can be traversed at right angles to the bed. Position of the ram is controlled electrically from a central control station. Vertical traverse is lever-controlled from control station. Pressure is indicated by a dial-type gage. This self-contained unit operates by electric power. A HPM Hydro-Power radial variable-delivery type pump generates the hydraulic pressure. Oil is used as pressure medium.

Maximum daylight space between ram facing and bed is 36 in. Ram travel is 18 in. max. Pump is driven by a 5 hp. electric motor.



...that Lighten the Cost Picture—Brighten Sales!

IN PRODUCTION—You'll get *new light* on assembly speeds when fumble-proof, slip-proof, damage-proof American Phillips Screws are on *your* job! These automatically straight-driving screws are a big answer to the demand, "We must have *more* production." And an equally big answer to "We must have *lower* costs"—because this *modern* method of fastening offers TIME-SAVINGS UP TO 50%!

IN PROMOTION—American Phillips Screws are the quality, high style fastening . . . in keeping with the rest of your product's sales-slanted design. The decorative *unburred* heads are eye-catchers (not clothes-catchers). They promise and *deliver* solid serviceability from here on in. Whether you make lamps or laundry equipment, boats or bicycles, your product can profit by your writing:

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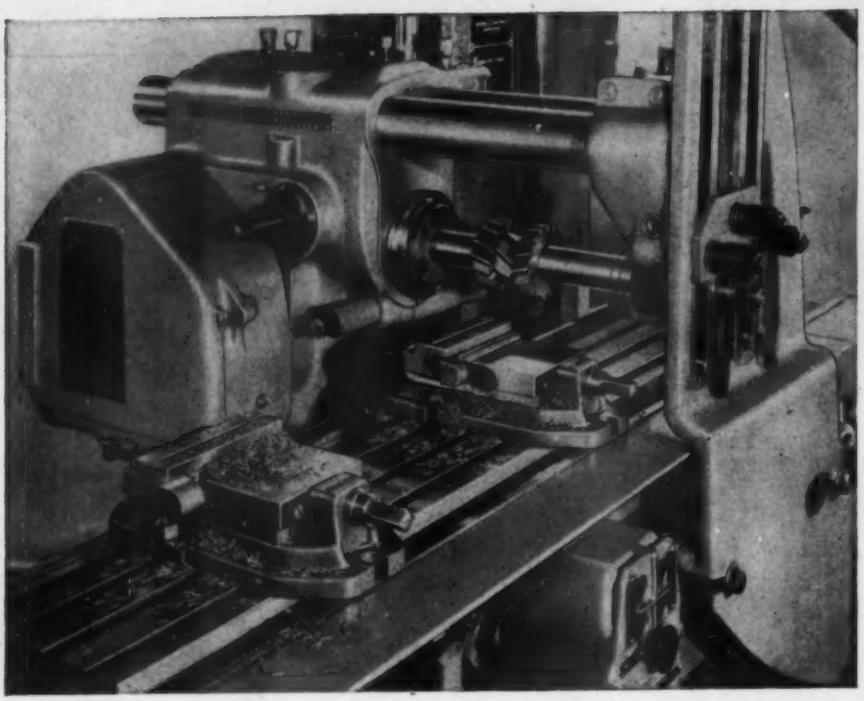
Chicago 11: 589 E. Illinois St. *Detroit 2:* 502 Stephenson Building

AMERICAN PHILLIPS *Screws*

ALL TYPES
ALL METALS: Steel, Brass, Bronze, Stainless Steel, Aluminum, Monel, Everdur (silicon bronze)

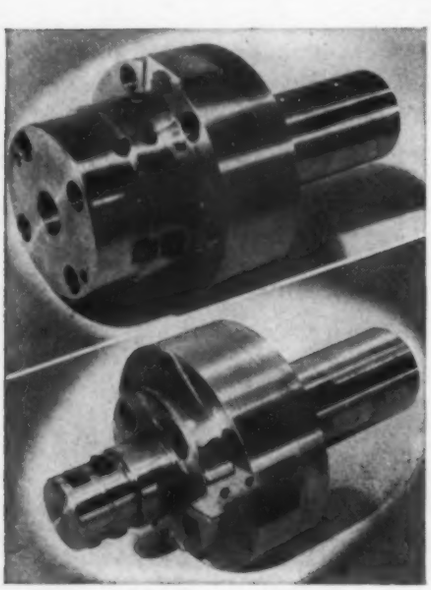


Milling Machine Spindle Power Feed Permits Lowering, Raising Spindle

A spindle power-feed arrangement for the No. 12 plain milling machine is announced by Brown & Sharpe Mfg. Co., Providence, R. I. Arrangement permits milling cycles that require accurate lowering and raising of the machine spindle with the regular table movements.

Settings are possible to position the cutter at two different heights in any cycle and to raise and lower the cutter several times during a cycle. Feed rates of the spindle head are possible from ½ to 7⅝ ipm., by use of change gears, and are independent of table feeds. Spindle head has a travel rate of 30 ipm. Drive is by brake-type motor. Arrangement is controlled automatically by the use of dogs operating electrical devices. Hand control is provided by knobs and buttons.

The available milling cycles are said to eliminate additional setup and extra handling time. Either 3- or 7½-hp. spindle drive is used.

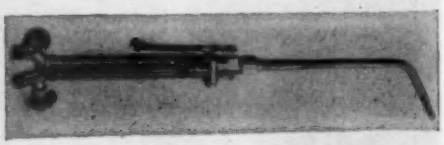


Combination Boring, Facing Tool Is Set Up for Four Operations

A combination boring and facing tool designed to accomplish four operations with one set-up of the workpiece, is introduced by the Maxwell Co., 386 Broadway, Bedford, Ohio. Multiple operations include rough and finish boring to within 0.001-in. tolerance and then rough and finish power face.

Tool is self-contained and activated within itself. Carbide-tipped cutter can be used. Actuating sleeve is connected to any push or pull rod that is hydraulically, pneumatically or mechanically operated. Tool can be used with any machine equipped with American spindle nose or similar means of attachment.

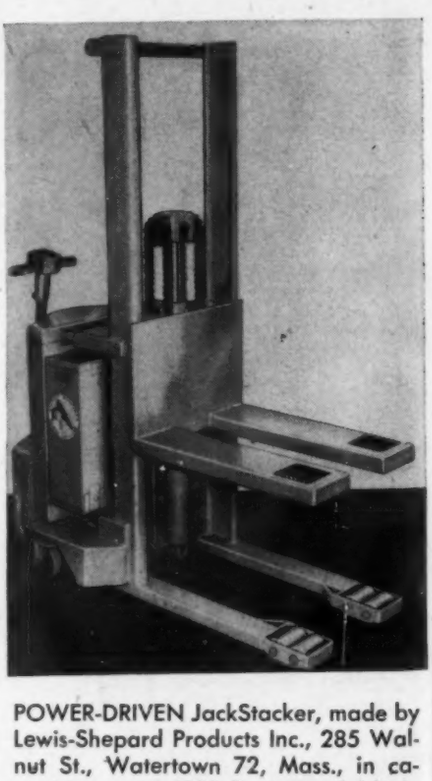
Tool, top illustration, will bore 5 5/16 in. max. and travel 1 in. to face 7 5/16 in. Smaller tool, lower illustration, will bore 1 7/8 in. min., and travel ¾ in. to face 3 3/8 in. dia. workpiece. Tools are available in any combination of capacities within the range.



Lever-Operated Welding Torch Maintains Built-in Gas Saver

An automatic welding torch the WA-54, with lever-operated built-in gas saver for production work in the rapid welding of small assemblies, is introduced by Wall Chemicals Div., The Liquid Carbonic Corp., 3100 S. Kedzie Ave., Chicago 23, Ill.

When laid aside, torch goes out except for a small acetylene pilot flame. Depressing the lever to resume work, reinstates welding flame without adjustment. The torch is available with a lever hold-down lock for continuous welding. Model is known as Wa-54-B.



POWER-DRIVEN JackStacker, made by Lewis-Shepard Products Inc., 285 Walnut St., Watertown 72, Mass., in capacities up to 4000 lb. is available in four models: counterweighted and straddle type for double-faced pallets; open-end base with lifting arms for single-faced pallets; and platform type for skid platforms. Designed for use in congested areas, unit has two speeds forward and reverse

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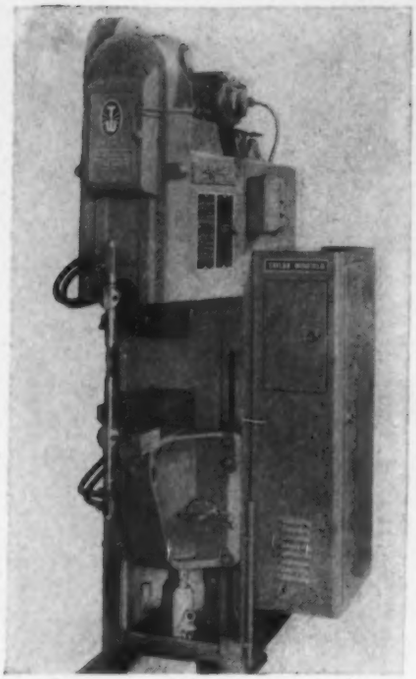
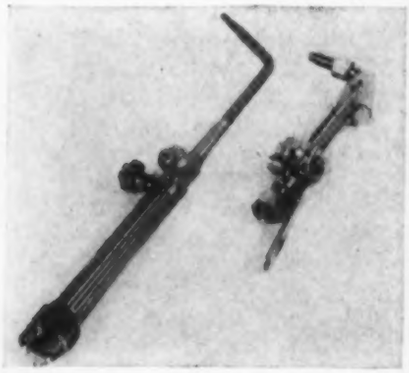


Improved Spot Projection Welder Employs Roller Anti-Friction Head

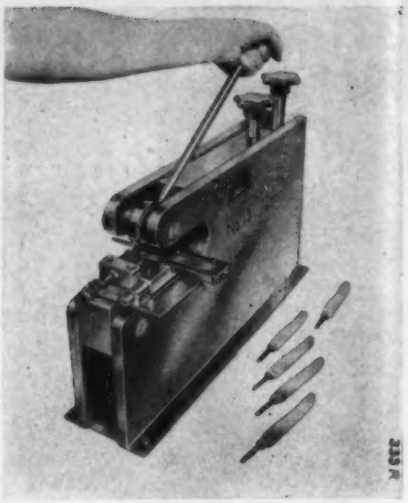
Taylor-Winfield Corp., Warren, Ohio has improved the Type ENB motor-driven press-type spot and projection welder. Improvements include the roller anti-friction head, the bellows air lock, an optional feature, and bearings for cam follow-up and drive box. Cam design is said to give higher speeds without hammering or defacing work. Up to 200 strokes per min. are possible with no alteration to the welder other than changing cams, pulley ratios within the range of ½- to 2-in. strokes.



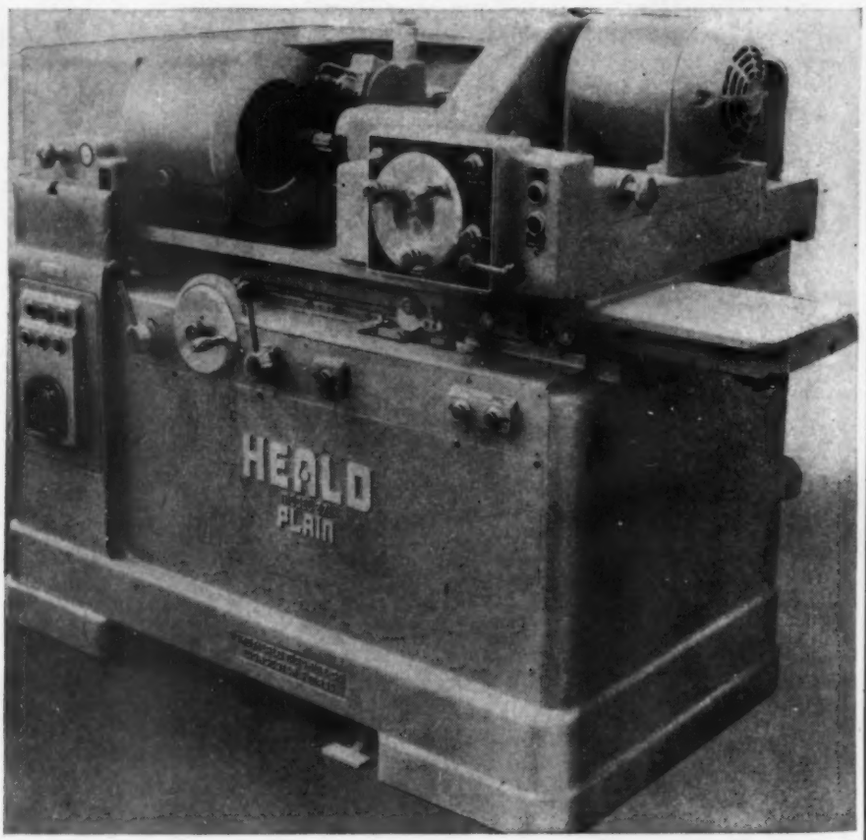
CUTTING ATTACHMENT for their Gasweld AV-10 lightweight welding torch is made by Wall Chemicals Div., Liquid Carbonic Corp., 3100 S. Kedzie Ave., Chicago 23, Ill. Cutting attachment enables use of torch as a precision tool for light cutting jobs. Tips for the WC-10 cutting attachment are furnished in sizes 0, 1, and 2

Rolling Process for Reamers Eliminates Heat Applications

The U. S. Tool and Mfg. Co., 6906 Kingsley Ave., Dearborn, Mich., introduces a procedure for making standard and special high-speed reamers. The high-speed steel cutter blades are secured in recesses of a tool by means of a rolling process which involves no application of heat as in welding or brazing, which is said to deteriorate temper, hardness, and durability. Worn and undersized reamers can be re-rolled at the factory to restore the original diameter to precision limits.



MULTI-LEVER spring-tension pressure-marking machine for marking cutlery blades and other tapered or beveled parts is made by The Acromark Co., Elizabeth, N. J. Machine is constructed for mounting on work bench and marks letters or design into finished blades by means of a roller die. Machine is 14 in. high, 6 in. wide, and 20 in. deep



PLAIN INTERNAL grinding machine, Model 271, is made by Heald Machine Co., Worcester 6, Mass., for small- to medium-lot production where an automatic cycle is not required. Control panel of the wheelhead cross-slide permits setting for rate and feed. Swing over table is 18 in.; max. length of hole that can be ground is 5 in.; table travel is 16 in. Table speeds are unlimited between 0 and 35 fpm.

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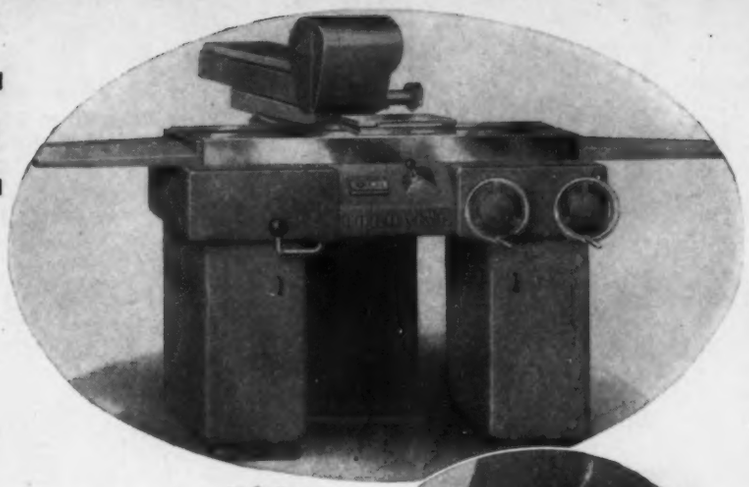
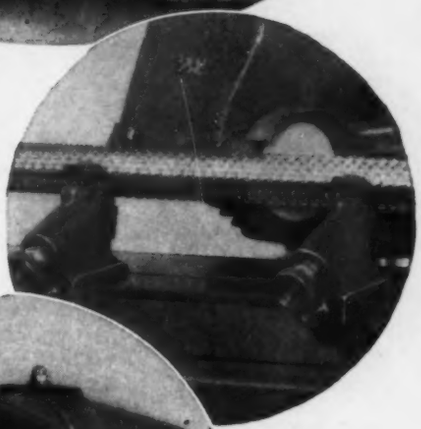
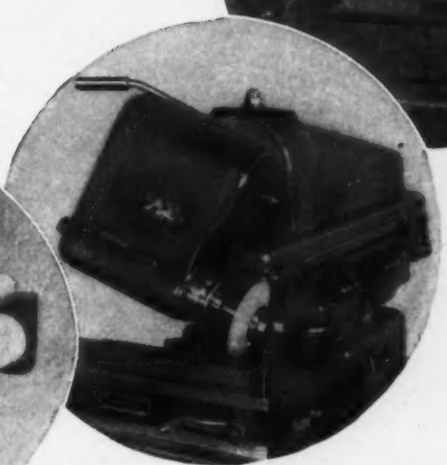


MODEL FS3
FOR FLAT BROACHES





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If you have both flat and round broaches up to 72 in. long	CS3-72
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Ask for complete information by model number

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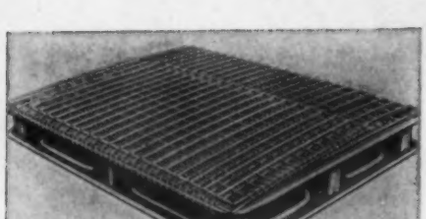
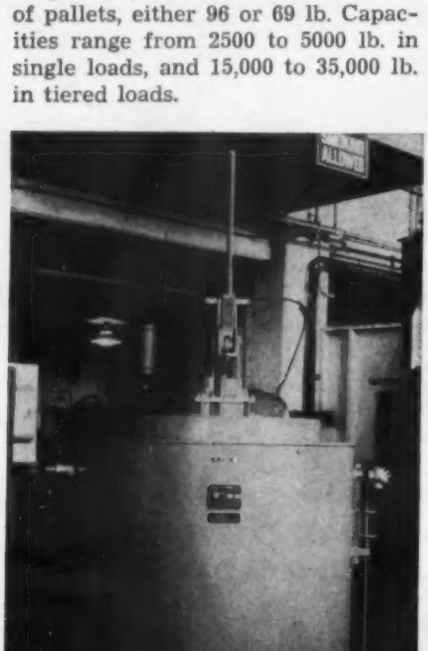


Monroe Collapsible Pallet Box Utilizes 40 x 48-in. Pallet Base

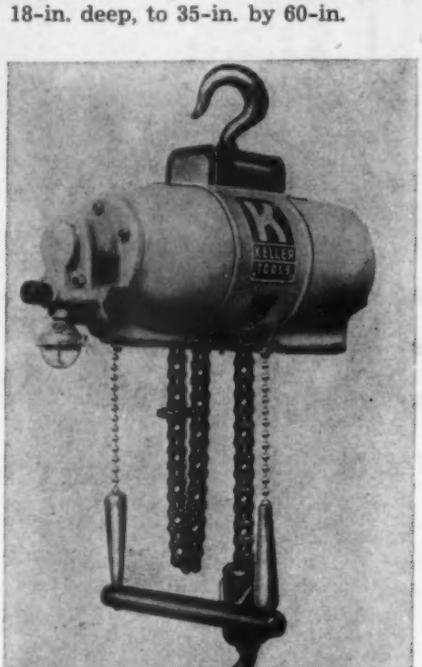
The Monroe Auto Equipment Co., Monroe, Mich., introduces a collapsible pallet box, and a line of accessories for pallets, platforms, skids, and boxes.

The collapsible pallet box utilizes an all-steel, 40 x 48-in. pallet as a base, and has 8-gage steel-wire sides 24 in. high. When not being used, wire sides fold down onto the top of the pallet, forming a unit 7½ in. deep. Box is available with a choice of pallets, either 96 or 69 lb. Capacities range from 2500 to 5000 lb. in single loads, and 15,000 to 35,000 lb. in tiered loads.



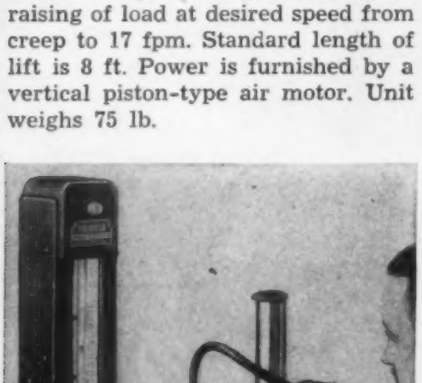
High-Temperature Stress Relief Offered by Tempering Furnace

A series of Homo furnaces for high-precision tempering, offered by Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia 44, Pa., performs continuously at 1650 F. Furnace handles high-temperature stress relief, cycle annealing, spheroidizing, normalizing and similar operations. A ribbon-type heater, and fan motors with water-cooled gland for protection against overheating, are provided. Capacities vary from 15-in. dia. by 18-in. deep, to 35-in. by 60-in.



Vertical Piston-Type Air Motor Employed on Keller Air Hoist

A 1-ton capacity air hoist, known as Model 86-2V20, has been developed by Keller Tool Co., Grand Haven, Mich. Hoists feature variable speeds which are said to give operator full control of positioning, lowering, or raising of load at desired speed from creep to 17 fpm. Standard length of lift is 8 ft. Power is furnished by a vertical piston-type air motor. Unit weighs 75 lb.



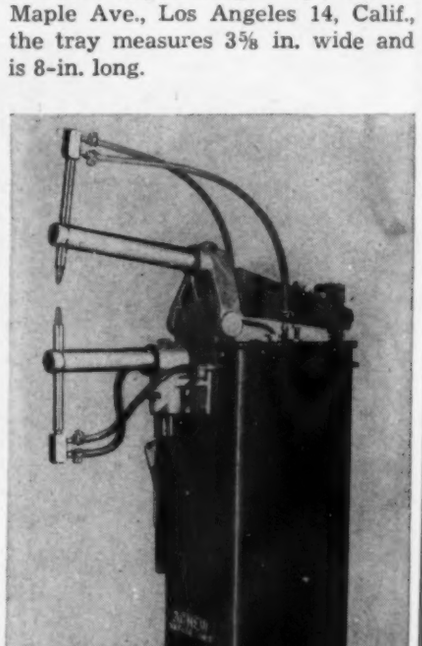
Precision Gage Blocks Checked By Air Pressure on Surfaces

Method of checking the length of precision gage blocks exerts air pressure against the upper and lower surfaces. Made by Sheffield Corp., Dayton, Ohio, no gage point contact exists. Comparator consists of a gaging unit and a Precisionaire base instrument with an amplification up to 40,000 to 1.

A master calibrated set of blocks are used in setting the comparator and obtaining a zero reading. The gage block to be checked is placed on the anvil between the two air gaging jets, one located in the anvil, the other in the gaging head on the bracket. Any change of the float from zero indicates deviation from the master. Amount is read directly from graduated scale.

Winslow Draftsman's Tool Tray Combination of Rack and Tray

A draftsman's tool tray, a combination of rack and tray, designed for triangles, rulers and other drafting materials, holds curves and triangles upright. Manufactured by Winslow Product Engineering Corp., 614 S. Maple Ave., Los Angeles 14, Calif., the tray measures 3⅝ in. wide and is 8-in. long.



FOOT-OPERATED pivot-type spot welder, type J, is made by Agnew Electric Co., Milford, Mich. Unit is furnished in 12-, 18-, and 24-in. throat depths with 10 kva. transformer. Transformer has a short secondary circuit resulting in high efficiency. Four-point tap switch has "off" position for setup purposes, and magnetic contactor and automatic switch for passing current only after pressure is applied to work

Automatic Carbon Arc Welding Simplifies Production of Rotors

By R. B. Keith, Mgr.
American Electrical Products Co.
Mansfield, Ohio

MANUFACTURING our small electric motors requires welding the ends of the copper bars in the rotor lamination assemblies after a previous mechanical upset of the bars during sub-assembly. The weld is required to produce a solid integral unit electrically, one that will eliminate the possibility of the laminations working loose under operating conditions. This process of welding or fusing copper or aluminum assemblies is typical of present day methods to obtain the highest degree of product quality and ruggedness.

Developing a semi-automatic welding procedure has not only reduced our costs considerably but has enabled the operator to obtain highly uniform results on a mass production basis. Our procedure has also simplified the operation problem into one of merely loading and unloading the rotor assembly to and from a fixture.

An indexing type of rotary table fixture (Fig. 2) incorporates three stations, one for loading, one for the work position in which the piece is rotated under the welding electrode, and one for unloading after welding. Hand operated positioning pins locate the table in alignment with the welding carbon electrode as each station comes into the welding position.

Carbon arc welding is performed with a Lincoln TA-3 "Electronic Tornado" automatic welder (Fig. 1), melting the upset ends of the copper bars and fusing the ends of the bars into a continuous ring. In the operating or welding station, the work-holding plug is set to rotate at a predetermined speed, allowing the periphery of the rotor face to travel under the carbon arc at the correct welding speed. A tilting adjustment on the table permits variation of the bead shape. A 2.32" diameter rotor is fused in a 15-second cycle, using 100 ampere current on the welder.

Fig. 1. Arc welding copper bars into a continuous ring. Cycle time—15 seconds.

Under production conditions, the table is fitted with a hood guard (Fig. 3) to shield the operator from the arc. The welding cycle is such that it allows the work to be removed from the furnace, where it is preheated to 700° F., and the work loaded onto the indexing table before rotating the table to the arc station position. The indexing of the table actuates cams that start the welding cycle, eliminating any need for the operator to push a starting button on each cycle. A machining cut is taken after the piece cools to square the face of the weld.

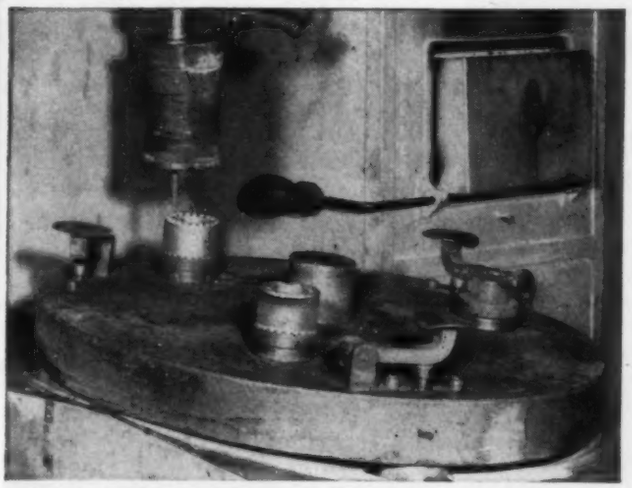


Fig. 2. "Electronic Tornado" Welder mounted on a rotary indexing table-type fixture—hood removed.

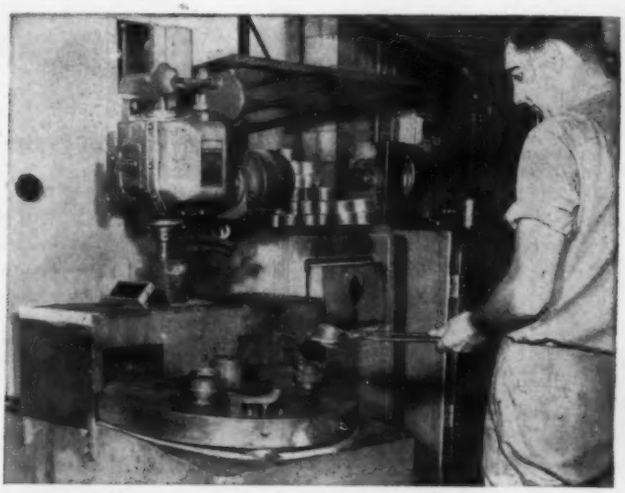


Fig. 3. Loading preheated rotor assembly on indexing table.

The above is published by LINCOLN ELECTRIC in the interests of progress.
Write for information on the "Electronic Tornado." The Lincoln Electric Company, Dept. 33 Cleveland 1, Ohio.

Parts and Materials

Corrosion-Resistant Stainless No. 20 Manufactured in Wrought Forms

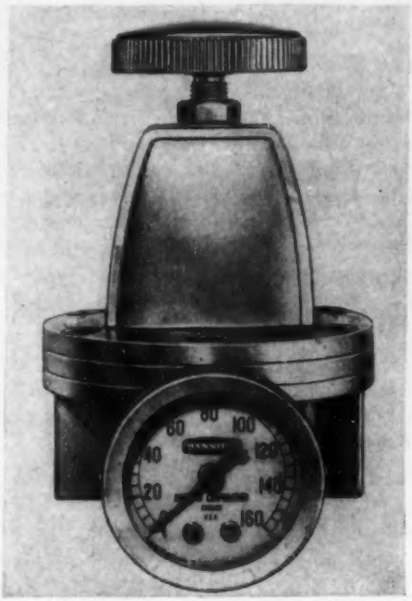
"Super corrosion-resistant" stainless steel, until now only available in cast forms, known as Durimet 20, and manufactured by Duriron Co., Inc., Dayton, Ohio, is now available in wrought forms such as bar stock, wire, strip, tubing and pipe, from The Carpenter Steel Co., Reading, Pa. Known as Carpenter Stainless No. 20, it is said to retain the good mechanical properties of 18-8 stainless steels.

Due to its resistance to the corrosive effects of sulphuric acid, as well as other substances, the steel can be used in the manufacture of heavy chemicals, organic chemicals, synthetic rubber, high-octane gasoline, and other materials.

The nickel content of approximately 29%, fortified with high chromium and molybdenum, provides a suitable matrix to place the copper in solid solution. The chromium present secures resistance to oxidizing acids.

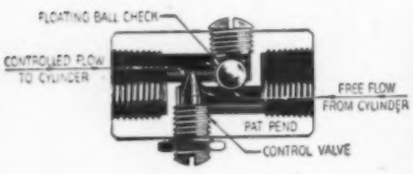
Featured is the steel's resistance to hot sulphuric acid. Carpenter stainless No. 20 cannot be hardened by heat treatment. Water quenching after heating uniformly to 2100 F. results in maximum corrosion resistance. Such treatment is given to the material during manufacture.

Material is said to have a tensile strength of about 85,000 psi., and a yield strength at 0.2% offset of about 35,000 psi., as well as a Brinell hardness of about 150 to 180, and a specific gravity of 8.02.



Air-Pressure Regulating Valve Controlled by Adjusting Screw

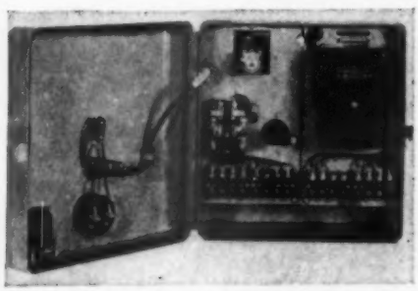
An improved automatic pressure-regulating valve for service on compressed-air supply lines is introduced by Hannifin Corp., 1101 S. Kilbourn Ave., Chicago 24, Ill. Designed for use on initial or primary air pressures to 150 psi., it can be set to maintain reduced, or secondary pressures ranging from 125 down to 5 psi. A free-floating valve stem allows backing-off or reducing delivered pressure under dead-end conditions by turning the adjusting screw. Control knob and adjusting screw provide close regulation.



Pneu-trol Flow Control Valve Offered in Three Pipe Sizes

A flow-control valve for air or hydraulic cylinder speed control is designed to provide accurate control of cylinder speed as well as unrestricted flow from the cylinder. Offered by Pneu-trol Devices, Inc., 3122 N. California Ave., Chicago 18, Ill., the valve is said to eliminate abnormal pressure of the exhaust from the return side of the cylinder.

When the flow is to the cylinder the ball check closes, and the flow is directed through the flow-control valve, which has a wide range of adjustment. The flow from the cylinder is unrestricted because the unloaded ball check opens wide on a slight change in pressure. Valve is made in ¼-, ⅜-, and ½-in. pipe sizes.



Control System for Oil Burners Utilizes Self-Checking Circuit

Control system for commercial oil burners composed of a master control unit, a phototube unit, and an electrode unit, is introduced by Control Div., General Electric Co., Schenectady 5, N. Y. The photoelectric combustion-control system shuts off the flow of fuel when oil fails to ignite or flame is extinguished after igniting.

On gas-electric ignition systems it prevents fuel from flowing when the gas pilot does not ignite. A self-checking circuit in the system prevents starting of the burner unless entire system is in proper condition.

Air Circuit Breaker by GE For Low-Voltage Circuits

An air circuit breaker for use on low-voltage circuits (600 v. and below) is offered by the Switchgear Div., General Electric Co., Schenectady 5, N. Y. Known as Type AK-1, unit is available in two ratings, AK-1-15, rated at 15 to 225 amp. with a 15,000-amp. interrupting rating, and AK-1-25, rated at 35 to 600 amp. with a 25,000-amp. interrupting rating.

Arcing time is said to be less than one cycle. Silver-alloy contact tips

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Whether you need efficient, good will-building compensation insurance, protection against liability claims, a fidelity bond, or insurance for your plate glass window . . . you will find Employers Mutuals services the open door to a new, fresh conception of insurance cooperation.

Employers Mutuals write: Workmen's Compensation—Public Liability—Automobile—Group Health and Accident—Burglary—Plate Glass—Fidelity Bonds—and other casualty insurance. Fire—Extended Coverage—Inland Marine—and allied lines. All policies are non-assessable.

Employers Mutuals' new booklet, "Comprehensive Crime Protective Insurance," explains how you may insure against all types of loss in your business from theft, robbery, fraud or dishonesty—all with a single policy tailored to your exact requirements. A copy of a "Dictionary of Insurance Terms" will help you to understand the provisions of all your casualty and fire policies. Send for either, or both, on your letterhead—or call your local Employers Mutuals representative.

Employers Mutuals Policies Protect Lives, Health and Property

EMPLOYERS MUTUALS OF WAUSAU . . . make insurance understandable

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EMPLOYERS MUTUAL LIABILITY INSURANCE COMPANY OF WISCONSIN
EMPLOYERS MUTUAL FIRE INSURANCE COMPANY
HOME OFFICE: WAUSAU, WISCONSIN
Offices in Principal Cities—Consult Your Telephone Directory

MODERN
MICROHONING is
AUTOMATIC
PROCESSING CONTROL

4 COMBINED RESULTS IN ONE PROCESS
★ GEOMETRIC ACCURACY
★ AUTOMATIC SIZE CONTROL
★ HEAVY STOCK REMOVAL
★ FUNCTIONAL SURFACE FINISH

MICROMATIC HYDROHONERS
equipped with Microhoning Tools

in many different installations have cut total processing by one or two operations—have reduced the over-all amount of waste stock removal—have generated uniform final size AUTOMATICALLY within 0.0001 to 0.0003-inch—eliminated selective fits in some parts—reduced inspections to one or two spot checks per shift.

The highlights of Modern Microhoning are available in sets of several booklets. Don't you want a set?

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8100 SCHOOLCRAFT AVE. • DETROIT 4, MICHIGAN
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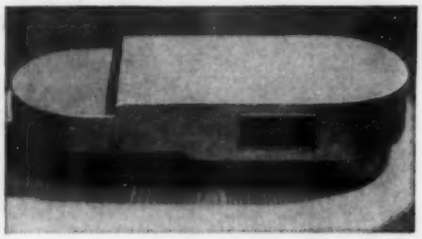
eliminate deterioration due to oxidation. Sealed-in overload trips are used. Breaker is available for electrical or manual operation.

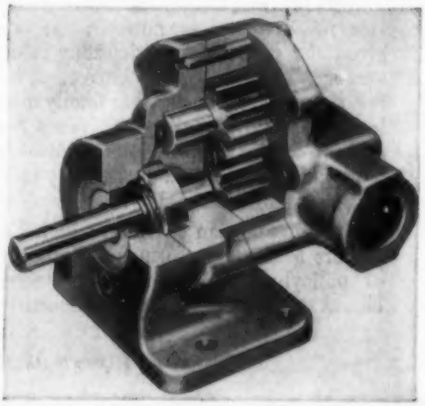


Black & Webster Foot Switch Pivoted Under Arch of Foot

The Model SA foot switch has its pivot located under the arch of the foot so that it operates with a rocking instead of a pushing motion. Made by Black & Webster, Inc., 126 Massachusetts Ave., Boston, Mass., the unit measures 9x3½x2½ in. Switch can be fastened to floor or other surfaces. Switch will operate as single pole, normally closed or normally open or as single pole double throw.

Fel-Pro 131 Rubber Stock Offers Low Compression Set

Synthetic rubber material, Fel-Pro 131, introduced by the Felt Products Mfg. Co., 1504 Carroll Ave., Chicago 7, Ill., is said to process a tensile strength of 1800 psi., and low compression set after extensive immersion in various fuels, oils, and solvents. It is also claimed to have a high temperature resistance (300 F. in hot oil).



Gear-Type Hydraulic Oil Pump Designed for 1000 psi. Service

A gear-type hydraulic oil pump available in various models with rated capacities at 1800 rpm., from 1.5 to 60 gpm., is announced by Adel Precision Products Corp., Burbank, Calif. Designed for 1000-psi. service,

BOTH* AGREE ON HANNIFIN Leakproof PNEUMATIC CYLINDERS

Product Designers

Specialists in product design have placed their stamp of approval on Hannifin Pneumatic Cylinders because Hannifin gives them what they want: A completely standardized line of cylinders, available in an almost infinite number of combinations. Any length of stroke specified, double acting or single acting. A wide choice of mounting styles, single or double end rods. Diameters from 1" to 12", or larger. Cushions for head end, rod end or both. Complete engineering data for working out cylinder applications in Hannifin Bulletin No. 57-G.

HONED Tru-Bored

A Model JR cylinder with adjustable cushion — one of many different types.

Operating Engineers

Plant operating engineers like Hannifin Pneumatic Cylinders because they seldom require maintenance — thanks to Hannifin's exclusive "Leakproof" design which permits external adjustment of piston packing without disturbing any internal parts. They also like the smooth, free-running performance that comes with cylinders made by Hannifin: TRU-BORED from steel cylinder stock; honed to satin finish by exclusive long-stroke honing process. This is also their assurance of full power performance and protection against air waste. For better plant operation, get genuine Hannifin cylinders. See your local Hannifin representative, or write.

*Also on... HANNIFIN "Packless" AIR CONTROL VALVES!

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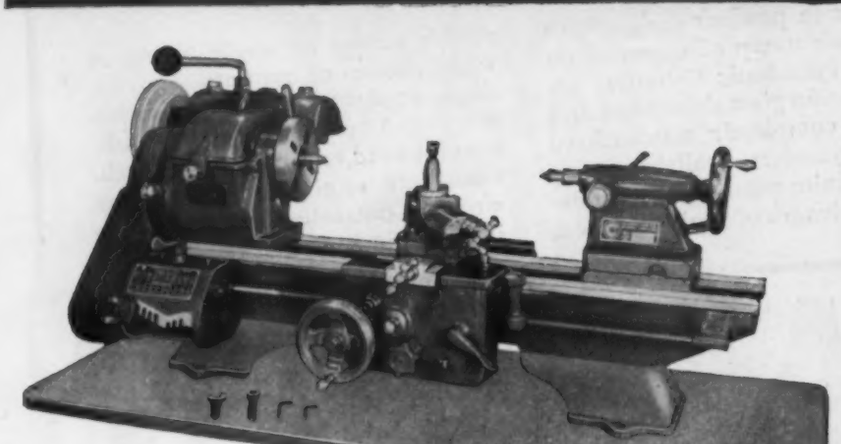
Clausing LATHES



CLAUSING Quick Change Model No. 110
Swing over bed—12"
Swing over carriage—7½"
Distance between centers—24"

Accuracy THAT STAYS PUT

Exacting users prefer CLAUSING Lathes because of their adaptability, convenience, and sustained accuracy even after years of service.

CLAUSING Lathes are precision built for precision work. The bed is a solid close grained gray iron casting made rigid by inverted U and box braces. All beds are rough milled, seasoned, then rough and finish ground. Vee and flat ways are machined to within .001 inch of parallelism. Husky carriage is gibbed both back and front to prevent climbing and insure maximum rigidity. Bearing surfaces on cross slide, saddle, and tailstock are checked for close contact not just the high spots which may check accurate but quickly wear out of alignment. Compact headstock with built-in countershaft is a single streamlined unit guaranteed to within .001 inch of absolute accuracy.

CLAUSING Lathes roll smoothly on adjustable Timken tapered roller bearings—plenty of extra stamina for high speed and end thrust. Final machining of spindle is done with the spindle running on its own bearings, assuring concentricity.

Before you buy—investigate CLAUSING for economy, convenience, and accuracy. Write for literature.

CLAUSING MANUFACTURING CO.
227 RICHMOND AVE. OTTUMWA, IOWA

MAIL COUPON FOR DETAILED SPECIFICATIONS

CLAUSING MANUFACTURING CO. OTTUMWA, IOWA U.S.A.

CLAUSING MANUFACTURING CO.
227 Richmond Ave., Ottumwa, Iowa

Please send complete literature on Clausing Precision Lathes.

*Name*_____

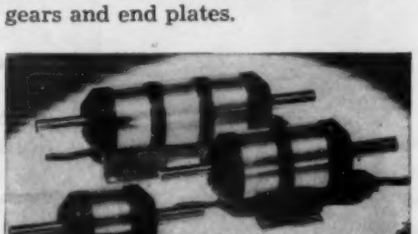
*Address*_____

*City*_____

*State*_____

pumps can be had in a variety of mountings.

A special seal used on the drive shaft is said to assure leakproof action and to eliminate packing difficulties. A ball-drive design permits gears to float endwise on shafts preventing thrust loads from being transferred from the shaft to the gears and end plates.



Metron Miniature Speed Changers Offer Low-Power Speed Changing

Low-power speed changing applications requiring high ratios are possible with the multiple-section miniature speed changers made by Metron Instrument Co., 432 Lincoln St., Denver 9, Colo. Units are offered in standard one, two, and three sections with ratios as high as 3375 to 1. Diameter is 1.050 in., and over-all lengths are 3 in. for one section, 3⅞ in. for two sections and 4⅝ in. for 3 sections. Speed changers are supplied in more than 500 speed ratios ranging from 9/10 to 3375. Hardened-steel spur gears are used throughout.

Manually Operated Snap Switch Starts Motors of 1 hp. or Less

The No. 600 manually operated snap switch for starting motors of 1 hp. or less, is announced by Allen-Bradley Co., Milwaukee, Wis. Unit has an overload device which operates on the soldered ratchet principle. Switch cannot be held closed under sustained overload, but can be reset with the regular switch lever, after overload is cleared.

Flexible Zincilate Coating Dries in Air Without Baking

Zincilate coatings available in two new types are introduced by Industrial Metal Protectives, Inc., Dayton 2, Ohio. Said to be anti-corrosive, they will airdry without baking, and are sufficiently flexible so that sheets, pipes and forms can be bent double without breaking the coating. Paint or enamel overcoatings can be applied after five min. of air drying, and both coatings baked at the same time.

6 out of 9*

leading makers of spark plugs use OAKITE CLEANING MATERIALS because . . .

. . . effective Oakite cleaning goes hand-in-hand with precision production to help keep unit costs low. Reason enough why leading spark plug manufacturers use Oakite materials on such operations as cleaning before and after heat treatment; pickling; descaling and related jobs.

What That Means To You: No matter what product you make, it will pay you to investigate Oakite materials for your production cleaning, descaling, degreasing, and related surface conditioning procedures. Oakite offers alkaline, acidic and solvent type cleaning materials . . . coolants and lubricants for machining and stamping operations . . . materials to rust-proof raw stock, parts in process, finished assemblies.

You Can Profit merely by asking your Oakite Technical Service Representative to review your cleaning cycles . . . suggest cleaning solutions to meet your exact needs. Chances are he'll show you savings sure to justify plant-wide standardization on Oakite materials. His services are free. Write today!

**rated AAAA in Thomas' Register*

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Technical Service Representatives Located in Principal Cities of United States and Canada

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Specialized Industrial Cleaning
MATERIALS • METHODS • SERVICE

CROSS UNIVERSAL GEAR MACHINES

for

- ROUNDING
- CHAMFERING
- POINTING
- BURRING

Cross Universal Gear Machines embody advanced engineering developments to obtain highest productivity and assure lowest possible operating costs.

They feature utmost flexibility for handling a wide variety of gears. Continuous cutting motion, exclusive with Cross, speeds production at top efficiency.

Special skill is not required because machines are automatic and push button controlled. Power clamping is foot pedal controlled. Both hands are free for work handling.

No. 55

For rounding, pointing, chamfering or burring external and internal:

spur gears
helical gears
clutches
splines

Typical productivity when rounding or pointing 8 pitch 30 tooth gears is 55 net hourly.

No. 65

For pointing or chamfering external and internal:

clutches
spur gears
bevel gears
splines

Typical productivity when pointing 10 pitch 30 tooth gears is 100 net hourly.

No. 75

For burring or chamfering both ends at the same time.

helical gears
spiral bevel pinions
hypoid pinions

Typical productivity when chamfering 8 pitch 40 tooth gears is 200 net hourly.

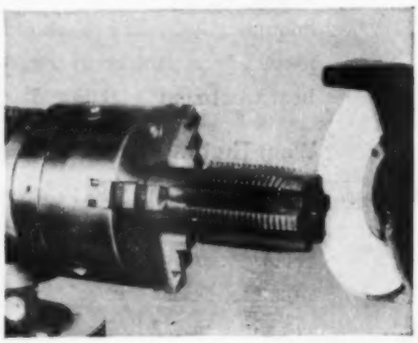
THE CROSS COMPANY
Established 1898

SPECIAL MACHINE TOOLS
MILLING • DRILLING • TAPPING • BORING
TURNING • SHAPING • GRINDING • HONING

DETROIT 7, MICHIGAN

Foster Capacitor-Start Motor Provides High-Starting Torque

A line of motors, available in split-phase or capacitor-start types, are offered by Foster Mfg. Co., One Kinsey Ave., Buffalo, N. Y. Motors are manufactured in 1/6, ¼, 1/3 and ½ hp. capacities, with or without thermal overload protectors. The single-phase motor has a capacitor connected in series with the starting winding, providing a high starting torque with low starting current.

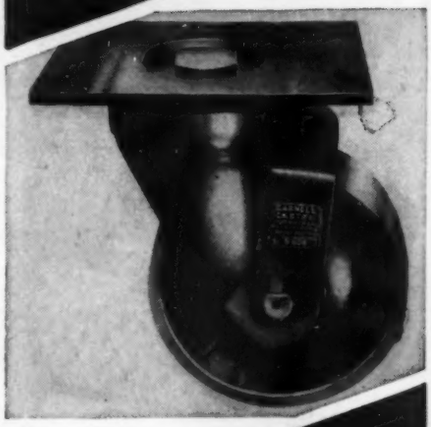


CHUCK for use with the D-S radial relief grinder is offered by the D-S Grinder Div., Royal Oak Tool and Machine Co., Royal Oak, Mich. Having a capacity of ⅛ to 5 in., it is mounted on a face plate equipped with ground arbor that fits the fixture spindle. Chuck can be used in place of collets when one or two tools of a size are radially relieved, and time is saved in interchanging collets

Steel Surface Conditioners Classified Acid Inhibitors

Surbrite S and Surbrite H, acid inhibitors, are again available from Hanson-Van Winkle-Munning Co., Matawan, N. J. The compounds are added to sulfuric, and hydrochloric acid pickling solutions, and have the ability of wetting or lowering surface tension and to cause the pickled steel to develop a bright, smut-free surface.

DARNELL CASTERS



DARNELL CORP. LTD.
LONG BEACH 4 CALIFORNIA
60 WALKER ST NEW YORK 13 N Y
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THE SIDES of a V-BELT

Diagram of V-Belt in Sheave-Groove

Are ALL that TOUCH the Pulley

The SIDES Do ALL the GRIPPING Naturally — They GET the WEAR!

The moment you look at a V-Belt in its sheave, you see that the *sides* are the only part that ever *touch* the pulley. The *sides* do all the *gripping*—they get *all the wear* against the sheave groove wall. The sides *pick up* the load. They transmit that load to the belt as a whole. And then, once more, the sides—and the sides alone—take hold of the driven pulley and deliver the power to it.

That is why you have always noticed that the sidewall of the *ordinary* V-belt is the part that *wears out first.*

That's Why the CONCAVE SIDE

A GATES PATENT

Fig. 1

Straight Sided V-Belt

Fig. 1-A

How Straight Sided V-Belt Bulges When Bending Around Its Pulley

You can actually feel the bulging of a Straight-sided V-Belt by holding the sides between your finger and thumb and then bending the belt. Naturally, this bulging produces excessive wear along the middle of the sidewall as indicated by arrows.

Fig. 2

Gates V-Belt with Patented Concave Sidewall

Fig. 2-A

Showing How Concave Side of Gates V-Belt Straightens to Make Perfect Fit in Sheave Groove When Belt is Bending Over Pulley.

No bulging against the sides of the sheave groove means that sidewall wear is evenly distributed over the full width of the sidewall — and that means much longer life for the belt!

Is IMPORTANT to You

Since the sidewall is the part that wears out first, anything that prolongs the life of the sidewall will naturally lengthen the life of the belt.

The simple diagrams on the left show exactly why the ordinary, straight-sided V-belt gets excessive wear along the *middle* of the sides. The diagrams show also why the Patented Concave Side greatly *lengthens the life* of the *sidewalls* of Gates Vulco Ropes. That is the simple reason why your Gates Vulco Ropes are giving you so much longer service than any straight-sided V-belt can possibly give.

The Concave Side is Even MORE IMPORTANT Now that SUPER VULCO ROPES *Are Available!*

Now that Gates *SPECIALIZED* Research has resulted in Super Vulco Ropes capable of carrying much heavier loads—fully 40% higher horsepower ratings—the sidewall of the belt is called upon to do even more work in transmitting these heavier loads to the pulley. Naturally, with heavier loading on the sidewall, the life-prolonging Concave Side is more important now than ever before!

The Gates Rubber Company

"The World's Largest Makers of V-Belts"

DENVER, U. S. A.

483

Gates

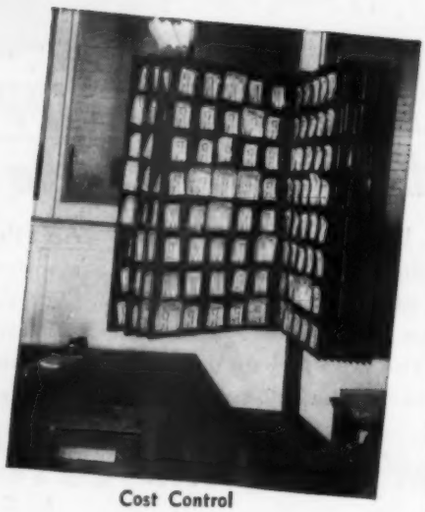
THE MARK OF SPECIALIZED RESEARCH

GATES VULCO ROPE DRIVES

Engineering Offices and Jobber Stocks IN ALL INDUSTRIAL CENTERS of the U. S. and 71 Foreign Countries

Production and Planning Dept.

Brass Shop Control



Cost Control

HOW MASON-NEILAN simplified Production and Cost Control

Mason-Neilan Regulator Co., Boston specialist in pressure, temperature and liquid level control equipment, simplified successfully more than eleven years ago with McCaskey "One-Writing and Visible Filing" systems. Their objective was to "hold down costs without sacrificing high quality standards."

Their controls include: the machine load for all machines at all times; the delivery of material to machines; the progress of each production order and the number of pieces produced daily compared with standards and schedules; the daily cost status of a thousand jobs in process; detailed costs almost immediately after their completion.

Three-copy time tickets made at "one-writing" provide identical data from the shop to three control divisions where they are immediately visualized on McCaskey Planning Boards for quick reference by planning and cost clerks. Their systems are stream-lined for speedy, effective action.

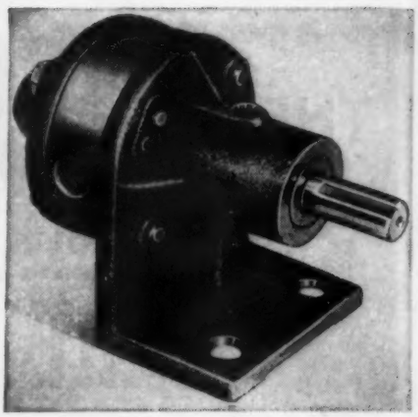
Write for a demonstration and suggestions for an application to your particular needs—or send for a copy of "The ABC's of Production Control" and other descriptive folders.

McCaskey INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • TOOLS • COSTS • PAYROLL

THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

McCaskey Systems Ltd., Galt, Canada — The McCaskey Register Co., Watford, England



ROTARY PUMP, series C-175, is offered by Ellipse Corp., 4140 N. Kedzie Ave., Chicago 18, Ill. Discharge is accomplished by mechanical action of vanes and rotor, as well as by centrifugal force. Unit features quiet operation at standard electric-motor speeds and eliminates need for belts and pulleys. Pump capacities ½ to 4 gpm. at 125-psi. working pressure, and comes in foot, flange, and sump mounts

ROUND TABLE Discussion

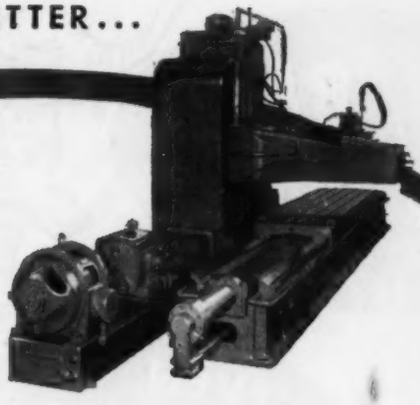
GOLDBERGING OR GOLDBRICKING?

Suggestion schemes can bring in worthwhile and valuable ideas; on the other hand they can lead to a lot of wasted time and material unless they are carefully operated.

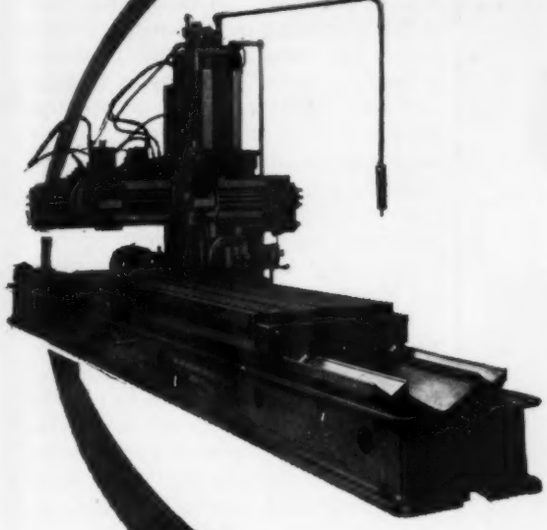
Ed's attitude is all wrong on the "brains" question. Nobody has a monopoly of brains; sometimes the expert, too, is too close to a problem to see it in proper perspective. Sometimes an outsider will have an idea on how to solve a problem which has got all the experts buffaloed completely. If experts are really experts, this won't happen often, but none the less, the few times it does make suggestion systems worthwhile.

The trouble always is to devise a system which will not be overloaded with the $0.50 sort of suggestion about extra spoons in the canteen or scented soap in the washrooms. A suggestion plan which allows people to spend $5.00 of the firm's time on a $0.50 suggestion is no good, but just how to combat this sort of thing is not an easy proposition to decide. One method is to have a minimum award, say $25, and make it clear that no suggestion that is not really

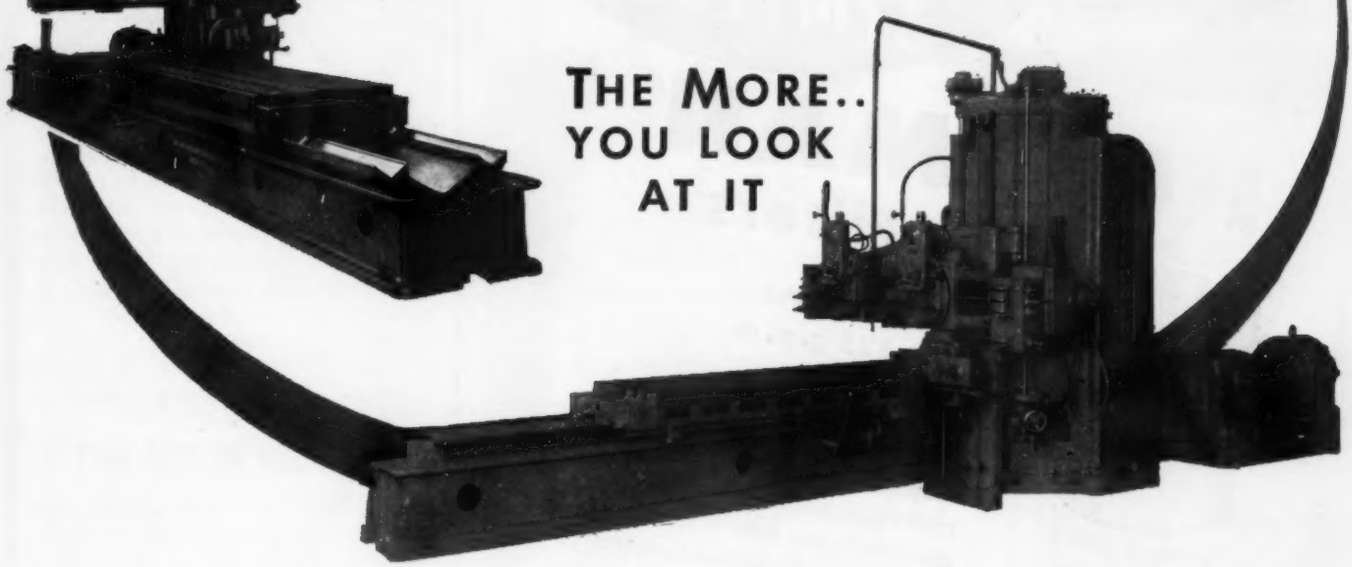
IT GETS BETTER...



AND BETTER...



THE MORE..
YOU LOOK
AT IT



The *New* ROCKFORD *Hy-Draulic* OPENSIDE PLANER

WRITE FOR THE FACTS

Ask for Catalog 450. Gives the complete story of the Rockford Hy-Draulic Openside Planer . . . built in four sizes, each in a selection of six stroke lengths from 10 to 20 feet.

Inspect the Hy-Draulic Openside Planer critically. When you do you'll be convinced that only Hy-Draulic design can give you all the advantages you want in a new planer. For example, levers in duplicate on either side of the bed plus the overhead movable pendant give full control of table travel and power rapid traverses. All adjustments are easily made; table cutting and return stroke speeds are set at the hydraulic pump . . . selection of speeds is infinite within a wide range . . . direction of power rapid traverses and feeds are selected by levers located at the column-end of the crossrail . . . Hy-Draulic Feed is set by simple handwheel adjustment. For proof of extreme rigidity, check the massive column of the Rockford Openside Planer. Every type of work and material may be cut without reducing accuracy. For complete details consult your nearest Rockford Hy-Draulic representative.

ROCKFORD MACHINE TOOL CO.
ROCKFORD ILLINOIS

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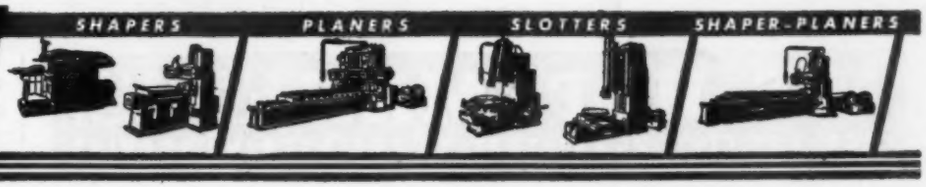

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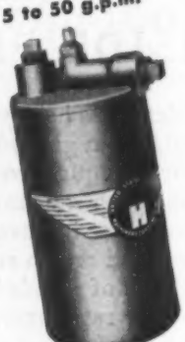
Disc Filters

with flow rates up to 125 g.p.m.

MODEL I 6-15 D
5 to 50 g.p.m.



MODEL I 4-15 D
1 to 10 g.p.m.

Originally designed for aircraft, the Hoffman Disc Filter has been adopted and improved for industrial applications. Thus, you can get continuous flow of clean coolant, even in "cramped quarters". First cost is low . . . no moving parts to get out of order . . . minimum maintenance.

Three sizes of this practical, efficient filter will remove dirt particles measuring from 3 to 5 micro inches. For further details and an estimate of the correct size for your requirements, write today.

MODEL I 6-90 D
50 to 125 g.p.m.

U. S. HOFFMAN MACHINERY CORPORATION
211 Lamson St., Syracuse, N. Y.
COOLANT FILTERS • FILTRATION ENGINEERING SERVICE

worth this will be considered at all; that definitely filters out the type instanced above.

To avoid waste it is well to encourage suggestors who have a promising idea to submit it for provisional consideration and award, and, subject to its provisional acceptance, assist the suggestor to develop it either in his own or the company's time, depending upon conditions. If it is established that such a practice is fairly carried out, then the temptation to spend time and material belonging to the company is largely removed. Whatever the setup, the people handling the scheme, preferably a committee, must inspire confidence, and no suggestion should ever be turned down without the suggestor being given every opportunity fully to explain and amplify his ideas.

Every help and encouragement should be given to suggestors, many of whom find it difficult to make intelligible sketches, or even to clearly set down their ideas in writing. Patience, goodwill and a genuine desire to help will go a long way here and are of inestimable value in getting the best out of a suggestion scheme.

K. N. Harris
Harrow, England

•

STEP DOWN OR STEP OUT?

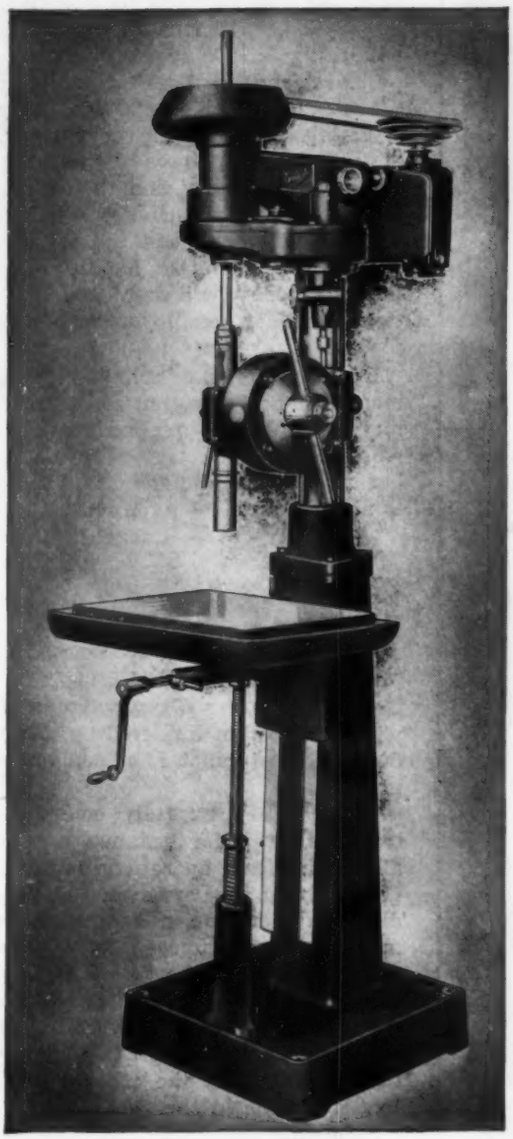
The problem of what to do with management men when age takes its toll ceases to be a problem when it is considered in the light that there is no substitute for experience. Management recoginzes the need of younger men in business and industry, and also realizes that the rapidity with which these younger men reach the actual productive stage is due entirely to the character and ability of the older men who train them.

The older employee may have to step down due to his decreased productivity, but he should not be forced to step out. His experience can be utilized for training younger men or in performing other less arduous work in the plant.

Many large organizations are well equipped with seasoned men for training; their directors realize the value of these older men, and know that youngsters will accept their instruction more readily than they would accept the teachings of a young theorist. Yet even with the best training in the world, there is a big gap between the beginning of the working period and the actual productive stage. This training period is costly, and it would be un-

FOR LOWER MANUFACTURING COSTS

YOU'LL CUT DRILLING COSTS with "Sensitive" Sixteens



If you drill in the range from 7/8" down, here is just the "extra service" tool to give you the most holes per drilling dollar. The "Buffalo" No. 16 Drill has fast speed adjustments from 400 rpm up to 3,000 rpm. Three sizes, 16", 24" and 30" swing, available in bench and pedestal types . . . featuring an efficient coolant system; power as well as sensitive feed; moderate cost and numerous combinations to fit your operational needs. And deliveries on the Sixteens are very good. Better send for your copy of Bulletin 2730 now, and see how these accurate, adaptable drills can cut your costs.

- BACK SPOT FACERS
- BAR CUTTERS
- BENDING ROLLS
- BILLET SHEARS
- DOUBLE END PUNCHES AND SHEARS
- LOCOMOTIVE SHEARS
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BUFFALO FORGE COMPANY

509 BROADWAY BUFFALO 4, NEW YORK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

Branch Offices in all Principal Cities

CONTINUOUS SERVICE—FASTER OPERATION—PEAK ACCURACY

New LOW PRICES on Carbide Tipped REAMERS

Check THESE LOW PRICES

Straight Shank — Straight Flutes

Diameter Inches	Number of Flutes	Shank Diameter Inches	Over-all Length Inches	PRICE
1/4	4	15/64	6	$3.75
9/32	4	15/64	6	4.00
5/16	4	9/32	6	4.00
11/32	4	9/32	6	4.25
3/8	4	5/16	7	4.25
13/32	4	5/16	7	4.75
7/16	4	3/8	7	4.75
15/32	4	3/8	7	5.00
1/2	6	7/16	8	5.50
17/32	6	7/16	8	5.75
9/16	6	7/16	8	5.75
19/32	6	7/16	8	6.25
5/8	6	9/16	9	6.25

Note: For taper shank requirements, use standard split sleeve reamer driver. Available at moderate price.

WENDT-SONIS SPE-D-CUT REAMERS

***Now* QUALITY *Carbide Tipped* REAMERS IN THE H.S.S. PRICE RANGE**

Low prices on the new line of Wendt-Sonis SPE-D-CUT reamers are made possible by standardizing on straight shank styles and the size ranges most widely used. Tools are designed to highest standards with precision tolerances (.0005 on dia.) and diamond lapped cutting edges. All sizes carried in stock. Get increased production possible with SPE-D-CUT carbide reamers at an initial tool cost only slightly higher than H.S.S. WRITE for catalog sheet on SPE-D-CUT reamers! WENDT-SONIS CO., Hannibal, Mo., 580 N. Prairie Ave., Hawthorne, Calif., 1361 W. Lake St., Chicago, Ill.

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CARBIDE CUTTING TOOLS

BORING TOOLS • CENTERS • COUNTERBORES • SPOTFACERS • CUT-OFF TOOLS
DRILLS • END MILLS • FLY CUTTERS • TOOL BITS • MILLING CUTTERS • REAMERS
ROLLER TURNING TOOLS • SPECIAL BITS

economical for management if it made no special provisions for it. What better way of taking care of the important training of new men could be devised than the utilization of the specialized experience of the older men.

Because the older man can no longer keep on top is no justification for letting him go. By being able to pass the value of his experience on to the younger man, his retention is jusified. Efficient management will utilize the older worker's experience and services in a lesser capacity in the plant and benefit by retaining the amicable cooperation of the other employees of the plant. Many workers may find themselves some day in the exclusive "step down or step out" club, and the way in which management handles the problem today will influence relations between employer and employee.

By adopting the policy that "a man may be down, but never out," management will realize tha real worth of the older trained man who has proven time and again that there is no substitute for experience.

Harry Kaufman
Phila., Pa.

•

GUARDS OR PRODUCTION?

You ask whether a competent man will be helped or hindered by safety devices. Just what is a competent man?

A man may be fully competent to run a lathe, for instance, and do all the intricate operations required of him, but at the same time he may dislike his foreman, and all management. He may be uncooperative, hate discipline, resent the "No Smoking" rule and, in short, be a "pain in the neck" to everyone who has to work with him. In spite of all this he may be, and often is, the most competent mechanic in the shop.

Accidents do happen to competent men, men who are rushing a job, or get out of time with a press, get a sleeve caught in a shaper tool, or anything else that causes trouble.

Some years ago while managing a press shop, we employed safety men who were not office workers, but who were former press operators, each of whom had lost a hand or several fingers in a punch press. These men had learned about safety the hard way. They roamed the floor at will, always and continually while the men were working. They had authority to stop any job they considered unsafe.

They stopped jobs I thought safe;

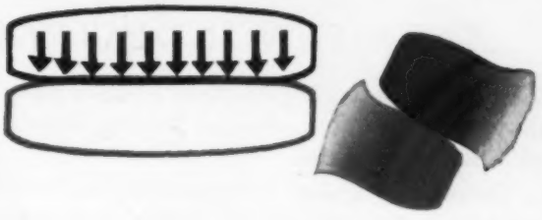
THIS MECHANICAL PRINCIPLE

Prolongs gear life and increases load capacity!

Pitch line section through two conventional teeth where a slight misalignment of the gears' axes throws heavy end bearing on both teeth.

If you wanted to break a gear tooth, you could do it easier by hammering on one end rather than in the center of the tooth.

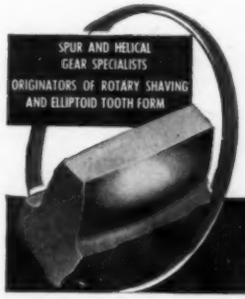
That is just what gear manufacturers want to avoid, so they prevent dangerous end bearing on gear teeth by shaving them to the Elliptoid form. Then slight misalignments due to deflections and manufacturing tolerances can't put critical loads on the ends of the teeth where they are most vulnerable. In other words, the specified lead tolerance is taken in a curved line rather than a straight one.



Similar section through two Elliptoid teeth. Although bearing extends across 85% of the tooth face, misalignment cannot impose end bearing on either tooth.

The Elliptoid or crowned tooth, exaggerated to illustrate the principle involved. Actual modification is normally less than .0005".

The Elliptoid gear tooth form is produced on Red Ring Rotary Shaving Machines. For further information, write for descriptive bulletin.



2868

NATIONAL BROACH AND MACHINE CO.
5600 ST. JEAN . . . . . DETROIT 13, MICHIGAN

"KEX" Industrial Wiping TOWELS

General View of Diesel Engine Test Shop, Baldwin Locomotive Works, Philadelphia, Pa.

...More Important Every Day to the *AMERICAN INDUSTRIAL SCENE*

This, a great Diesel Engine plant, is one of many of America's vital industries where KEX Industrial Wiping Towels contribute to greater efficiency of operation.

The reason why KEX Industrial Wiping Towels have won for themselves such an important role is because they have been produced *for wiping only*. They have no harsh seams . . . no hidden buttons . . . no abrasive particles to mar delicate and expensive surfaces.

They come in neat, easily stored bundles that help control distribution—*every wiping towel* in the lot is *thoroughly cleaned and inspected before delivery to you.*

Take your cue from industrial leaders who make it their business to keep operating costs down—and efficiency up.

Nothing to Buy—No Expensive Inventory—Just a Low Monthly Rental. The first month should show a decided saving on wiping costs.

For complete information, see your classified Telephone Directory for nearest KEX distributor, or write KEX NATIONAL SERVICE, 295 Fifth Avenue, New York 16, N. Y.

"KEX" NATIONAL SERVICE

REG. U.S. PAT. OFF.

they left other jobs to run that I felt hazardous, and they convinced me that they were right in all cases. In spite of all this, in one year in five plants we averaged the loss of one hand a week.

We know that we have to be on guard continually. Safety is a never-ending marathon that takes continual fighting and plugging to achieve even a modest victory.

Ed might just as well stop kicking. The world demands Safety, and Production, too. Men come first, and the guards will just have to be tailored to handle the work—after they protect the men.

James K. Matter
Detroit, Mich.

•

Safety and how to get it has been a problem for years. A few years ago the job of Safety Engineer was created. Unfortunately for operating personnel, it became a good racket for many men. Some safety directors today do not have the slightest knowledge of machinery or how to make machines safe.

Don't get me wrong . . . safety engineering is badly needed. Properly administered, it will increase production and keep the accident rate down.

Safety, like anything else, must be sold to the employee. The supervisor must be sold on safety and on his safety engineer. He must constantly talk and train safety in his department.

Guards alone do not make a safe shop. I know of one company which had an accident frequency 50% higher than the national average. This same company, today—two years later—has an extremely low frequency. This was accomplished by training foremen, supervisors and employees to be aware of unsafe operations.

Safety committees were established, and each month they go over the plant looking for unsafe things. These findings may be anything from a broken-down ladder to a door which swings the wrong way.

A program calling for the use of safety glasses was put into effect. All employees, while in the manufacturing area, were required to wear safety glasses. This rule also holds for all office personnel going into the plant. The glasses were fitted to each employee, and those who required corrective lenses were properly fitted for them. This helped to get employees' eyes into proper shape and eliminated lost time from eye strain.

More recently, safety shoes have

The POPE *Sealed Package Motorized Spindle for 6" x 18" Surface Grinders*—produces superior finishes, roughs off surplus metal fast, runs cool and delivers full 1 HP at the wheel. Motor and husky SKF Super-Precision Double Row roller bearings are *both sealed in.* Lubrication can't get out; dust, dirt, nuts, bolts and fingers can't get in!

Write for Data Sheet 12

The POPE *Sealed Lubrication, Totally Enclosed Fan Cooled Motor, Vertical Spindle For Surface Grinders, Planers And Boring Mills.*

Fitted with 1, 2, 3, 5, 10, 15 or 20 HP motor, running at 1200, 1800 or 3600 RPM. The Spindle has the bearing capacity and rigidity to do better work and more of it. It may be equipped with wide flange or tapered nose for *quick mounting* of a variety of wheels or tools.

Write for Data Sheets 16, 17, 18, 19.

These, of the hundreds of types and sizes of Precision Spindles designed and built by POPE, are the two that have earned the highest rating for superior performance by the manufacturers using them.

If you want to step up both the quantity and quality of the output of your grinders, planers, boring mills and the like, these are the Spindles that can do it.

No. 49

POPE

TRADE MARK REG. U.S. PAT. OFF.

POPE MACHINERY CORPORATION

ESTABLISHED 1920

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Introducing

the new PRESS-RITE No. 12 - 12 TON PUNCH PRESS

Here is a new press designed for those who need equipment slightly heavier than the standard 10 Ton unit. The new PRESS-RITE No. 12 is a heavy duty 12 Ton Open Back Inclinable Press with many outstanding features such as

1. New built-in single stroke non-repeat mechanism. Has new type clutch dog engaging in 4 point contact steel clutch plate attached to flywheel hub. This feature provides maximum operator, press, and die safety. Single stroke mechanism may be quickly changed for continuous operation.

2. New patented automatic cam actuated brake. Eliminates hot brakes. Makes brake adjustments for light or heavy dies unnecessary.

3. Anti-friction roller bearings in flywheel.

Other standard features include larger die clearances . . . frame reenforcements to avoid any possible deflection at any vital point . . . triple ramway lubrication for long life and heavy duty bearings.

GREATER SAFETY

PRESS-RITE engineers have been vitally concerned with the safety of press operators. With the design of the new positive acting single stroke clutch and the new automatic cam actuated brake, all PRESS-RITE Presses now have the greatest safety features ever built into a line of punch presses. These features more than protect the operator . . . they protect the dies and press too!

INVESTIGATE PRESS-RITE PRESSES

There is a complete line of PRESS-RITE Presses from 5 to 30 Ton capacity to meet your requirements.

Ask your dealer about them today or write us, Dept. 78.

Sales Service Machine Tool Co.

2363 UNIVERSITY AVE. ST. PAUL 4, MINNESOTA

been introduced and the use of them has stopped many accidents within the last six months.

So, Al and Ed, you see that guards and efficient safety programs under a competent director can pay off. Production in this particular plant has continued to increase each year and with a decrease in lost-time accidents.

We need in industry today, better trained and educated safety engineers, men who can talk shop language and who know what they are actually talking about.

Charles D. Townsend
Centralia, Mo.

•

Safety devices and practices in any organization are developed for the major purpose of reducing production costs, a statement which apparently disregards the humanitarian angle. That is not the case, however, as lost-time accidents, occupational diseases, and accident maiming are losses to the employer, as well as to the employee.

No safety devices, however numerous and well designed, will be completely effective unless accompanied by employee safety training as well. This means a safety department with an active head, adequate records and definite rules.

A few years back I worked for a gas range manufacturer. We had a real safety department with a head, records, and rules. Our machines were old, and not in the best condition. However, belts and gears were adequately guarded. In our punch press department, in one three-year period, we had no serious accidents, no amputations, and only a single minor accident.

To achieve that record, we had three inflexible rules that were never permitted to be broken. We insisted on: 1. Use of tongs where necessary. 2. Use of vacuum cup lifters. 3. Definite adherence to this rule: "No part of the body is to be between the punch and die when any part of the press is under power."

Fred H. Schacht
Detroit, Mich.

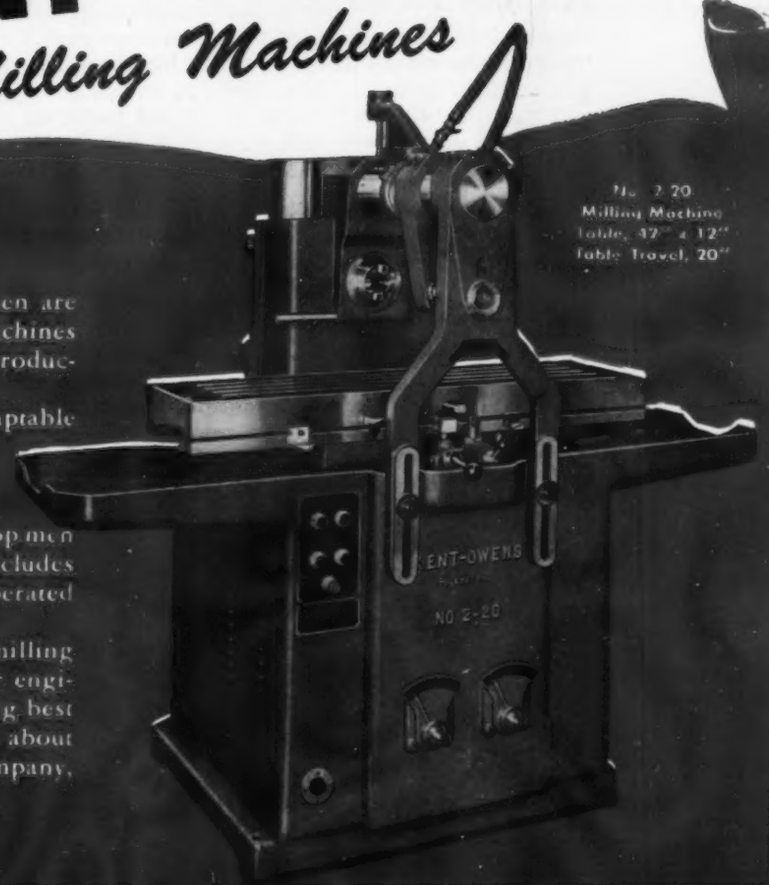
•

Ed's gripe about machine guards is justified if they have been improperly designed. In many cases, installation of a machine guard increased production by eliminiating fear. In other cases, the guard instigated the design of an automatic feeder, greatly increasing production and lowering the accident rate.

A competent man would be one

"KO" HIGH COSTS IN MILLING

with KENT-OWENS *Milling Machines*



Today more than ever—production men are depending on Kent-Owens Milling Machines for the *speed* and *accuracy* that keeps production UP and costs down!

These machines are versatile—adaptable to countless milling jobs. They're outstandingly rugged . . . efficient . . . dependable. Designed for easy handling with practical features that shop men like. The Kent-Owens Standard line includes a wide range of hydraulic and hand operated machines.

If you're "floored" by a tough milling problem—call on Kent-Owens! Let our engineers recommend machines and tooling best suited to your requirements. Write us about your needs. Kent-Owens Machine Company, Toledo, Ohio.

Quick Delivery on Cast Bronze Bearings

Here is Good News for manufacturers of all types of equipment. Now you can secure all your requirements in cast bronze bearings . . . particularly in the larger sizes . . . in *days* . . . not months. Our new and enlarged facilities plus new equipment and new methods have made this excellent delivery possible.

On standard stock items . . . UNIVERSAL Bronze Bars, G. P. Bearings, Electric Motor Bearings . . . we can ship your order the day it is received.

Why not check your requirements NOW? Send us your prints and your specifications. Remember, Johnson Bronze makes every type of Sleeve Bearing . . . an unfailing source of supply with the highest reputation for quality. Write, wire or call—TODAY.

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JOHNSON BRONZE
SLEEVE BEARING HEADQUARTERS
BRANCHES IN 20 INDUSTRIAL CENTERS

who could get maximum production or best quality from a machine with the guards in place. The rate of accidents for competent and incompetent men runs about the same. The incompetent are hurt because of ignorance or carelessness, the competent because they are careless from over-confidence, hence take chances more frequently.

This can be further illustrated by comparing the lifting of heavy pieces. One way would be to grab hold of a heavy casting and throw it on the machine. The correct way is to wrap a sling around it and by means of a hoist, place it in the machine. The second method might take longer, but at the end of the day more production will be accounted for due to less fatigue, facility of positioning the work, and quicker unloading. Of course, the danger of physical injury is also reduced.

The solution of Ed's problem is to redesign the safety devices and eliminate interferences wherever possible. Where this cannot be done efficiently, an hour extra in production is easier to tolerate than a day at the doctor's.

Frank J. Zarnowski
Rutherford, N. J.

"Quotes"

SAMPLING RISKS

C. W. Kennedy of Federal Products Corp., in discussing modern quality-control techniques at the 1947 annual ASME meeting, pointed out that a sample is not always necessarily the duplicate or fascimile in miniature of the aggregate, that there is an inherent risk of error. He advised:

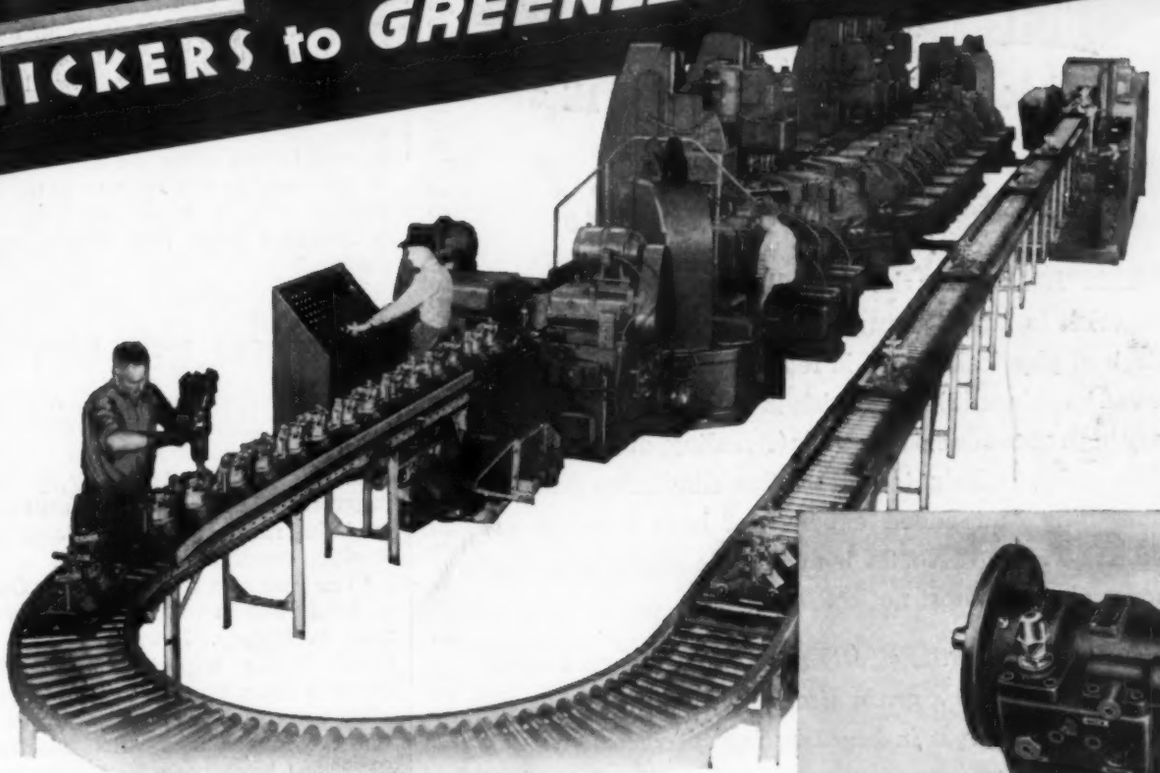
"The manner in which a sample is taken will naturally help to reduce the accident of sampling or, if the sampling is done in a negligent, sloppy manner, it will aggravate the error. The sample is to be free of any influence other than chance. It must be unprejudiced and unbiased, impersonal and impartial.

"If you were delegated to show a New Zealander on his first visit here the kind of people in New York City, would you confine his sightseeing solely to the Bronx, or Harlem? Or to Chinatown only?

"You may hold a preconceived opinion that the work from a certain department or vendor is bound

A Cost-Cutting DOUBLE PLAY

VICKERS to GREENLEE to Kelvinator



This 24-station, 152-tool Automatic Transfer Processing Machine was built by Greenlee Bros. & Company to aid Kelvinator in reducing the cost of machining refrigerator compressor bodies. With the many machining operations involved on these high-production parts, work handling is as important as metal cutting in obtaining a low cost.

All functions of the machine are accomplished with the aid of Vickers Hydraulic Equipment . . . and all of the pumps and control valving were supplied to Greenlee by Vickers. Two types of pumps are used in the installation for transfer and unit head operation. The pump for operating the unit heads is shown at the right.

Consult the Vickers Sales Engineering office in your area for information on how Vickers Hydraulic Equipment can be applied to meet your requirements.

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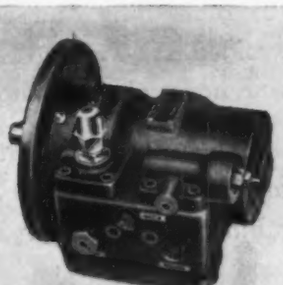
Sales Engineering and Service Offices: ATLANTA • CHICAGO • CINCINNATI • CLEVELAND DETROIT • LOS ANGELES • NEWARK • PITTSBURGH • PHILADELPHIA • ROCKFORD • ROCHESTER • SEATTLE • ST. LOUIS • TULSA • WASHINGTON • WORCESTER

Engineers and Builders of Oil Hydraulic Equipment Since 1921



VICKERS BALANCED VANE TYPE PUMP

This efficient and dependable source of hydraulic power has a number of extraordinary advantages that improve the product upon which it is used. The exclusive *hydraulic balance* construction prolongs pump life by entirely eliminating bearing loads resulting from pressure. Automatic wear take-up is provided without appreciable change in performance and correct running clearance is automatically maintained throughout wide temperature range with its resulting differential expansion of pump parts. For the many other features, ask for Bulletins 38-14 and 40-25a.

3435

OVER ONE HUNDRED YEARS OF CONTINUOUS SERVICE. ROUNDS, SQUARES, FLATS, HEXAGONS, OCTAGONS

BILLETS AND FORGINGS FOR PRODUCTION, TOOL ROOM AND MAINTENANCE REQUIREMENTS.

"B" No. 3X ALLOY STEEL IS

6 ways better!

HY-TEN "B" No. 3X is the ideal alloy for heavy duty parts because (1) it is supplied in the heat-treated condition to your desired physicals (2) it is readily machinable at high degrees of hardness (3) high finish is obtainable with either ordinary high speed or carbide tools (4) scaling, distortion and straightening are eliminated (5) it often eliminates grinding (6) rehandling and added expense of heat treating are avoided. HY-TEN "B" No. 3X is available immediately from warehouse stock at short notice.

WL *steels are metallurgically constant. This guarantees uniformity of chemistry, grain size, hardenability—thus eliminating costly changes in heat treating specifications.*

Write today for your FREE COPY of the Wheelock, Lovejoy Data Book. It contains complete technical information on grades, applications, physical properties, tests, heat treating, etc.

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HY-TEN and AISI

to be poor. Hence you will approach it without an open mind and either slight the sample or else definitely search for defects till you manage to find some. This is unconscious self-justification. To an extent a sample may be made to say most anything if you want it to, like a ventriloquist's dummy.

"Take a 'random' sample, which means one piece is as likely to be selected as any other. Dig; don't skim the top. Pieces in the bottom of the pan, box or bag are just as important as the middle layer or top crust.

"While the 'chance' in sampling varies, it need now vary to an unlimited extent. If you roll the dice enough times, you are bound to come up with a seven. And here is where the mathematician enters. He is able to tell what we can expect for accuracy in a sample, or to put it another way, what the dead limits of inherent error may be in any sample."

•

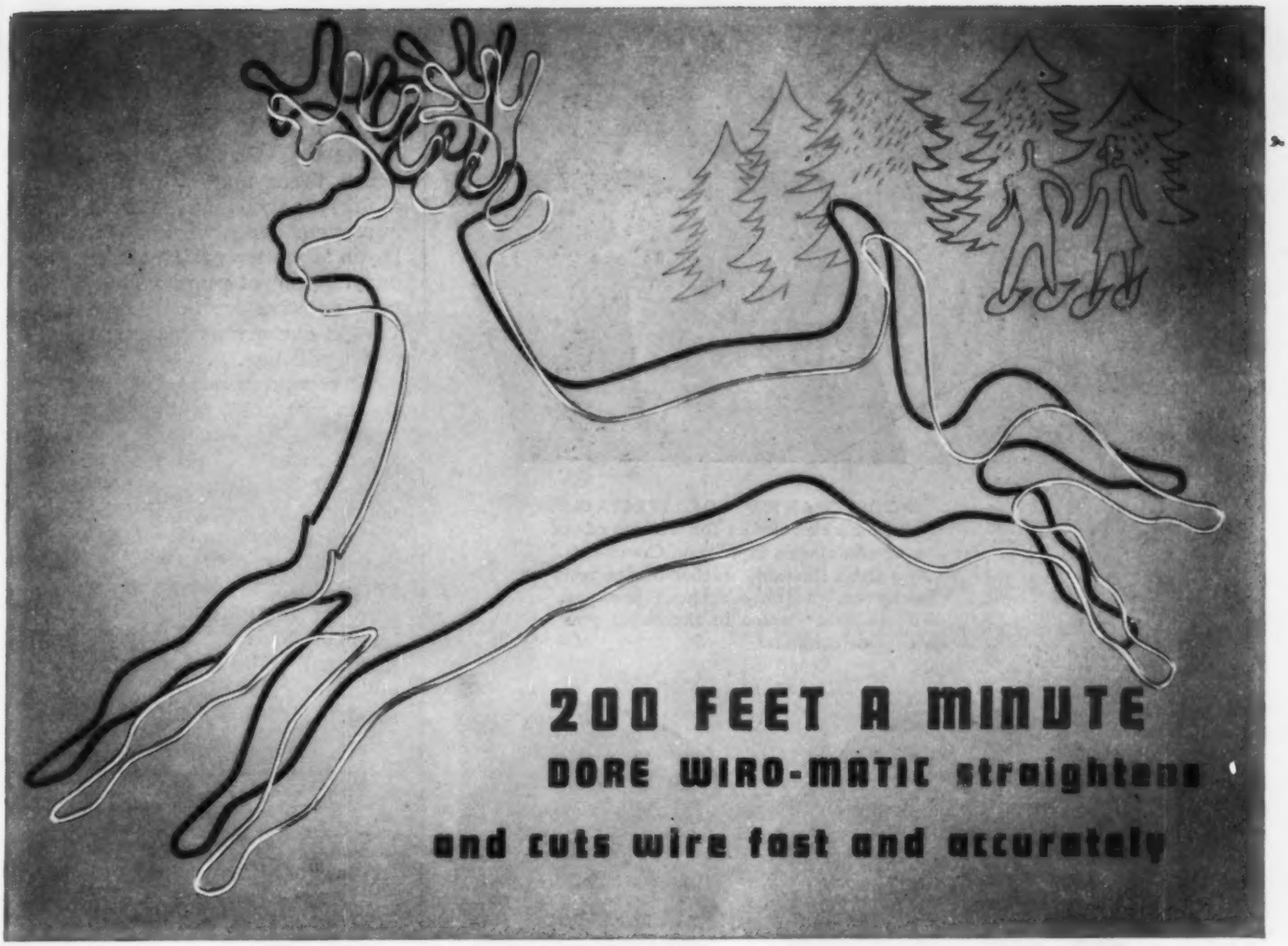
A BETTER PLACE TO WORK

Wm. B. Given, president, American Brake Shoe Co., keynoted the 12th annual meeting of the Industrial Hygiene Foundation by stating progressive management's attitude on industrial hygiene as related to working conditions.

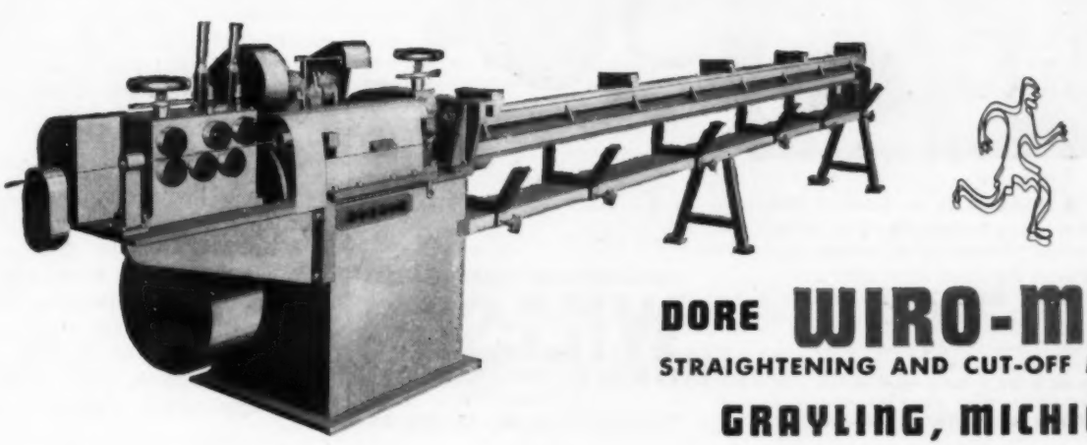
"The year was 1933," he said. "Our company was in red ink for the first time in history. Returning from a plant-visiting trip to the Pacific Coast, a telegram was handed to me after the train left Omaha. It read, 'Thirty-four silicosis suits totalling $2,700,000 have been filed in behalf of Chicago Heights employees.'

"I had a lot more hours of train ride to think that over! Visualizing the possibilities on the money side—this was only one of our 39 foundries—our tangible net worth was under $25,000,000. From the human side we in management thought we were doing a job making our plants proper places to work. But the question on that train was, 'Were we?'

"Then for a while I comforted myself with the racket angle. Some lawyer had spent lots of time building up the group and organizing this suit. On the other side were the questions: Were we really going all-out in eliminating danger? Did we as yet realize just what were the possibles in working conditions for our men? The answer to that was a definite 'No.' On that train trip from Omaha I decided that it was time we went to school and really learned how to accomplish the possibles in



A Dore WIRO-MATIC cuts up to 200 ft. of wire per minute — perfectly straightens and trims to lengths of less than an inch up to 20 feet *within a tolerance of plus or minus .005".* • There are three main reasons a Dore WIRO-MATIC maintains such production speed: Dore clutch is actuated instantly by a micro-switch and solenoid, and its 6 engaging surfaces *insure split-second operation.* Cutoff knife cuts wire on both forward and reverse stroke. Shuttle bar receives new wire while it discharges cut stock. • Other WIRO-MATIC features include easily accessible spinner dies which are in plain view; reversible double-grooved feed rolls; steel core V-belts; dies available to handle every type wire; welded steel construction. • Three Dore WIRO-MATIC Models available for 30 to 60 day delivery. Model A for wire .040" to .156" dia., Model B for wire .120" to .250" dia., and Model C for wire .120" to .312" dia. • Write for catalogue of WIRO-MATICS, reels, wire trucks, rotary straighteners, and special wire working machinery.



DORE WIRO-MATIC
STRAIGHTENING AND CUT-OFF MACHINES
GRAYLING, MICHIGAN

In the Glare of the Torch— think of WILLSON

Style CW60

ROOM WANTED FOR SPECTACLES? . . . There's comfort for wearers of prescription glasses in Willson Cover-Alls.* And the adjustable leather bridge rests lightly on the nose without pressure. Willson-Weld* lenses in the shade you specify, of course.

Style RW50

GAS WELDERS GO FOR IT . . . Assured protection of Willson-Weld lenses and comfortable face fit make this goggle day-in, day-out favorite for flame cutting and cleaning as well as welding. Indirect ventilating ports exclude glare.

Style DC50

FOR EYES THAT LEAD A DOUBLE LIFE . . . From welding to chipping with a flip of the wrist! Willson-Weld lenses in separate frames flip up to leave eyes protected by clear, Super-Tough* lenses.

For complete information on these products and their application, as well as many more eye and respiratory protective devices, get in touch with your nearest Willson distributor or write us direct.

*Reg. U. S. Pat. Off.

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DOUBLE WILLSON PRODUCTS INCORPORATED

Established 1870

235 WASHINGTON ST. • READING, PA.

achieving the greatest industrial health.

"During the next period of months we did not enjoy those law suits. Today I say they were one of the best things that could have happened to us and especially to me, a fairly new chief. From then on, improvements in working conditions began to get top priority in our company. In recent years we have never been satisfied for one moment, and I hope our company's management never will be. . . .

"If you rate the best people in the trades you need, gradually you will get them. As you do, costs will be affected and profits improved. Management has always known the importance of right people. In the old days you went out and looked for them. In recent years we have realized that to get them we must earn the reputation of being a better place to work. In the future, no plant will rate the best people without a successful medical department."

NEW BOOKS

LABOR RELATIONS AND HUMAN RELATION—*By Benj. M. Selekman, Kirstein Professor of Labor Relations, Graduate School of Business Administration — Harvard University. Published by McGraw-Hill Book Co., New York, N. Y. Price $3.00.*

In a study of labor relations, and stressing the quality of labor-management relationships as well as the problems of collective bargaining, this book suggests beginnings in approach, and necessary action in establishing employer-employee understanding upon the entrance of a union to a workplace.

•

SPI HANDBOOK—*Published by the Society of the Plastics Industry, Inc., 295 Madison Ave., New York 17, N. Y. 451 pages, 6x9 in. Price $7.50 to non-members, $4.50 to members.*

The first complete and authoritative reference book dealing with plastics, this work fills a serious gap in the literature of the plastics industry. Following a complete classification of plastic molding materials, chapters deal with forming and molding; design of molded articles; design standards for inserts and their application; standards for tol-

analyze it and you'll specify

Aluminum CASTINGS

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Fast Delivery — New Sales Appeal
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***And Now*... Hi-Tensile Strength**

Guaranteed aluminum casting delivery can end for you a major production bottleneck. But most important, aluminum castings offer many new design, performance, and cost cutting opportunities.

Acme is not only an outstanding source for aluminum castings but today makes available two outstanding new high strength alloys explained below. Now, for the first time, cast and malleable iron can be replaced at no sacrifice in strength. And the same is true of brasses, bronzes and mild steels.

Send Blueprints for prompt quotations. If you need assistance, remember Acme has the complete organization to help you at any stage from initial design to finished parts ready for assembly — and in some cases, the entire product itself.

Acme Services: *Aluminum, brass, bronze castings — patterns — tools — engineering.*

REPLACE *Cast, Malleable* IRON

The highest combination of strength, ductility, and impact resistance of any "as cast" aluminum casting alloy. Ideal where heat-treatment is too costly or unobtainable.

ACME ALMAG 35

	Min.	Typical
Tensile strength, psi	33,000	38,000-41,000
Yield strength, psi	16,000	18,000-21,000
Elongation, 2"	9%	10%-15%

The highest combination of strength, ductility, and impact resistance of any aluminum casting alloy. Free machining, beautiful finish, highly corrosion resistant.

ACME ALMAG 55

	Min.	Typical
Tensile strength, psi	50,000	55,000-60,000
Yield strength, psi	28,000	32,000-35,000
Elongation, 2"	16%	20%-30%

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TRIPLE A

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precision in production quantities

Our business is to produce precision gears in production quantities to customers' specifications, and to meet the delivery schedules previously agreed upon. Our proficiency in our chosen business is conceded to be high—chiefly because of a policy which was initiated by the management of Perkins nearly 30 years ago: We like to have our customers look upon our maufacturing facilities as part of their *own* plant, and work with them on that basis of close cooperation. Once your specifications are in our files, reorders are filled automatically. Let us quote on your requirements now.

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Our extensive facilities and modern machine tools are also adaptable to the manufacture of all kinds of various parts other than gears, such as the following:

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up to 2¼" in. diameter

We are also exceptionally well equipped to build, to your specifications, such mechanical units as—

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erances; cementing and assembly; mold design and materials; testing; machining and finishing; and laminated products. Profusely illustrated, the book contains a wealth of practical information on all phases of the spreading plastics industry.

Of particular interest is the closely detailed chapter on mold design, covering all the basic types of molds and their application to various types of parts. The information on the various types of steel for mold making is also very valuable. A complete index eases use of the book.

•

JOB EVALUATION—*By Jay L. Otis, professor of psychology and director of the Personnel Research Institute, Western Reserve University, and Richard H. Leukart, director of Industrial Relations, National Screw and Mfg. Co. Published by Prentice-Hall, Inc., 70 Fifth Ave., New York 11, N. Y. 473 pages. Price $6.65.*

This most complete, authoritative and easily understood book is directed to persons—management personnel as well as those employed in wage administration—who need a knowledge of what constitutes sound wage and salary administration and of its techniques. Job evaluation, as one of these techniques, affords a definite program for administering wages, correcting wage inequalities and installing more systematic methods of pricing jobs. It provides the facts on which management, and employees too by collective bargaining, may act.

The book covers all the factors affecting job evaluation and gives, as well, much detailed information on its actual planning, installation and operation. Reliability and validity are treated intelligently, and good ideas are given on establishing the wage curve and pay structure.

This book will also prove useful in conducting college-grade courses on the subject, because it is so well rounded-out factually and it brings together the thoughts of leaders in the field.

•

ADVENTURES IN BUSINESS—*Supplement to Adventures in Business 1947. Published by Nichols Field Wilson, 112 W. Ninth St., Los Angeles 15, Calif. Price $0.25.*—

A composite review of successful business ventures, incorporating the details leading to success and the difficulties overcome, is presented in digest form, encompassing men and women from every walk of life.

Production Increased 80%

. . . by using CLE-FORGE SPECIAL PURPOSE DRILL

Test Shows Results of Selecting the Right Stock Drill for the Job

One of our Service Representatives, watching this screw machine operation on a stainless steel part, recommended changing from regular to a Special Purpose CLE-FORGE High Speed Drill. As a result, production was boosted more than 80% *with no increase in tool cost.* This illustrates the great importance of choosing exactly the right drill for every job. Many times you'll find that a CLE-FORGE High Speed Drill designed for special purposes will give faster production at lower cost. A CLEVELAND Service Representative will be glad to analyze *your* drilling problems, without cost or obligation. Get in touch with our Stockroom nearest you, or . . .

Telephone Your Industrial Supply Distributor.

THE CLEVELAND TWIST DRILL CO.
1242 East 49th Street **Cleveland 14, Ohio**
Stockrooms: New York 7 • Detroit 2 • Chicago 6 • Dallas 1 • San Francisco 5
Los Angeles 11 • London W. 3, England

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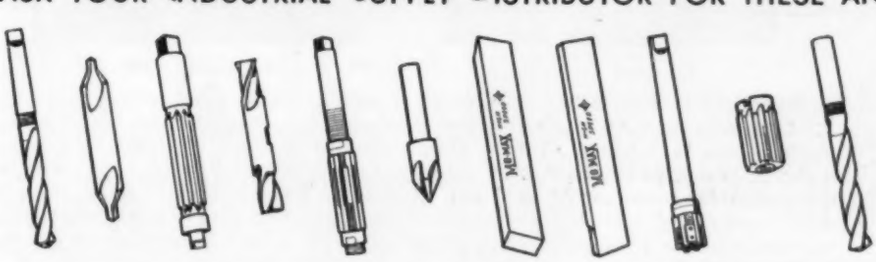
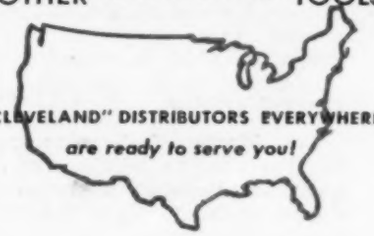
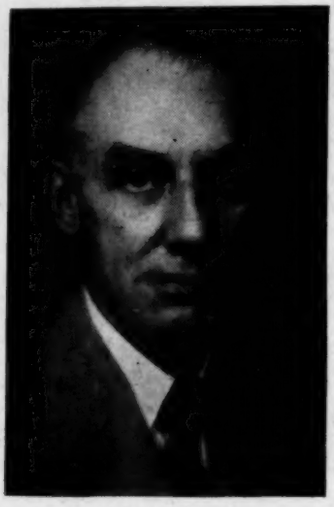




Names in the News



Samuel Newman

M. A. Hollengreen

Samuel Newman, former president, has been elected chairman of the board of the Landis Tool Co., Waynesboro, Pa. He is succeeded as president by **M. A. Hollengreen,** previously vice president and general manager.

Peter Altman has been appointed vice president of Continental Motors Corp. in charge of the newly-organized Multi-Tool Div. with Detroit offices at 620 Ford Bldg.

J. E. Ashman has been elected vice president of the Rockwell Manufacturing Co., Pittsburgh. He was formerly with Burroughs Adding Machine Co. and U. S. Steel Corp.

Fred P. Biggs has been appointed first vice president of the Brake Shoe & Castings Div. of American Brake Shoe Co. He will continue as vice president in charge of sales of the Brake Shoe & Castings and Southern Wheel Divisions.

Ronald S. Drysdale, special representative in charge of metalworking and cutting oil fluids for Sun Oil Co., Philadelphia, since 1920, has retired. Mr. Drysdale will continue as a special consultant and will undertake a series of cutting oil experiments at the company's Marcus Hook refinery.

Three founders of the Hyde Park Foundry and Machine Co., Hyde Park, Pa., have retired after 53 years as active heads of the company. **Charles T. Slonaker** succeeds **Thomas W. McCausland** as president, while his son, **Edward M. McCausland,** was named vice president, replacing **James Lees. N. H. Slonaker,** secretary-treasurer, is succeeded by **G. Edward Glifton.**

Col. Martin F. Scanlon, retired, has been appointed director of exports for Republic Aviation Corp., Farmingdale, N. Y., with headquarters in Washington.

Charles J. Reimer has been appointed general purchasing agent for SKF Industries, Inc., Philadelphia.

O. B. Wilson has been named industrial manager for the eastern sales region of the Brown Instrument division of Minneapolis-Honeywell Regulator Co., with headquarters in New York.

H. E. Cable, welding engineer in the Pittsburgh area since 1943, has been appointed district manager of the Pittsburgh office for Lincoln Electric Co., Cleveland.

Dr. A. B. Kinzel has been elected president of Union Carbide and Carbon Research Laboratories, Inc.

Lewis B. Williams has been elected a member of the board of Warner & Swasey Co., Cleveland, to replace the late **Robert F. Bingham.**

A. N. Morton and **A. C. Fetzer** have been elected vice presidents of Mack Trucks, Inc., New York.

E. P. Cunningham has been named divisional sales manager of the Detroit office of the Clearing Machine Corp., Chicago, with offices at 7-232 General Motors Bldg.

Clarence J. Smith has been appointed chief engineer of Hydro-Line Manufacturing Co., Rockford, Ill.

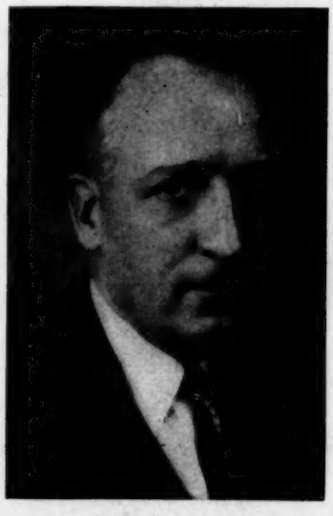
Harry M. Hubbard has been appointed district representative for the Cleveland and northeastern Ohio territory of the Waltham Grinding Wheel Co., Waltham, Mass.

Hugh J. Ferry, secretary, treasurer and vice president of Packard Motor Car Co., Detroit, has been elected a member of the board.

Roger Kenna has been elected president of the Marlin Fire Arms Co., New Haven, Conn., succeeding his father, the late **Frank Kenna.** Mr. Kenna has been serving as vice president of the L. C. Smith Gun Co., a Marlin subsidiary. **Theodore F. Lynch,** general manager of Marlin for 13 years, has been elected a vice president of that firm and the L. C. Smith Gun Co.

W. K. Millholland, Jr., succeeds father as head of W. K. Millholland Machinery Co., Indianapolis, Ind.

Raymond B. Crean



R. Nevin Watt

Raymond B. Crean has been elected assistant vice president, production, of the Baldwin Locomotive Works, Philadelphia, while **R. Nevin Watt** has been elected assistant vice president, domestic sales. He was appointed sales manager of the Standard Steel Div. in 1930 and 12 years later became general sales manager of Baldwin. **Ronald C. Disney,** former assistant general manager of sales has been named manager of domestic sales. New sales manager of the Hydraulic Press and Power Tools Section at Eddystone, Pa., is **Robert G. Tabors.**

Baush "W" Type machines are especially adaptable for both flange drilling and rectangular hole layouts. Available in 3 sizes, shown in specifications, with adjustable arms to handle drilling of hole centers that constantly vary—or with master-bored cluster plate having spindles in fixed pattern to fit one operation. Horsepower capacities are graduated to cover predominant drilling operations.

Spindle heads are of adjustable, joint driven type, with slip sleeve spindles that can be furnished in various standard sizes to meet work requirements. "W" Type machines are arranged for 18" maximum stroke of heads—adjustable feed rates—2 speed geared yokes and can be adapted for tapping. Either adjustable knee tables or box table can be supplied.

Also available in single way, 2-way or 3-way machines.

SPECIFICATIONS OF STANDARD W-TYPE MACHINES

	W-6	W-7	W-8
Maximum Horsepower Capacity for Spindle Drive	10 H.P.	20 H.P.	30 H.P.
Top of Base to Bottom of Head Flange, Head up	60"	54"	50"
Max. Standard Stroke of Head	18"	18"	18"
Overall Height of Machine with low base	139"	141"	150"
Approx. Net Weight of Machine (Lbs.)	15,000	20,000	27,000
Head Sizes Available—Measurements taken between Spindle centers as follows: At Side, S. At Front, F.	18"S. x 24"F. 18"S. x 36"F. 24"S. round	20"S. x 30"F. 20"S. x 45"F. 32" round 36" round	20"S. x 30"F. 20"S. x 52"F. 32" round

BAUSH
MACHINE TOOL CO.
SPRINGFIELD 7, MASSACHUSETTS

Taking the Distance Out of Your Steel Problems

Urgently needed by a Los Angeles engineering company, was a large shipment of stainless steel pipe in a special size. A call to the Ryerson plant in Los Angeles disclosed that the required pipe was not in Los Angeles stock, but *was* on hand in another city.

Ryerson Los Angeles immediately phoned Ryerson in Chicago. Could Chicago supply the desperately needed pipe? Chicago could —and did! The material was quickly trucked to a Chicago airport, flown to Los Angeles, and delivered at the customer's plant the following morning, less than 24 hours after the order was received.

That's how Ryerson — when the steel *is* available—can take the distance out of your steel problems. That's how the twelve closely cooperating plants of the Ryerson Steel-Service System often accomplish the seemingly impossible in an incredibly short time. And that's the sort of far-reaching service you can look for when you contact any Ryerson plant for any steel requirement.

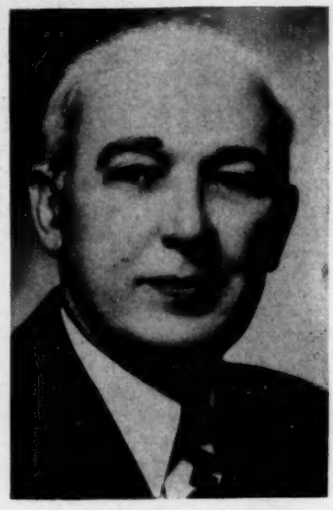
Joseph T. Ryerson & Son, Inc. Plants at: New York, Boston, Philadelphia, Detroit, Cincinnati, Cleveland, Pittsburgh, Buffalo, Chicago, Milwaukee, St. Louis, Los Angeles.

PRINCIPAL PRODUCTS

Bars—hot and cold rolled
alloy steel
reinforcing
Structurals
Plates—
Inland 4-Way Floor Plate
Mechanical Tubing
Boiler Tubes and Fittings
Allegheny Stainless—
sheets, plates, shapes, bars, tubing, etc.
Sheet and Strip Steel
Tool Steel
Wire, Chain
Bolts, Rivets
Babbitt
Metal Working Tools & Machinery, etc.

RYERSON STEEL

NAMES IN THE NEWS



Frank J. Whelan

Frank J. Whelan has been elected a vice president of Worthington Pump and Machinery Corp., Harrison, N. J., in charge of the industrial and oil field merchandising activities of the corporation. Mr. Whelan has been with Worthington for 14 years and since 1943 has been assistant to the vice president as well as manager of the Reciprocating Pump Div. He is succeeded in the latter position by **Alvin F. Welsh.**

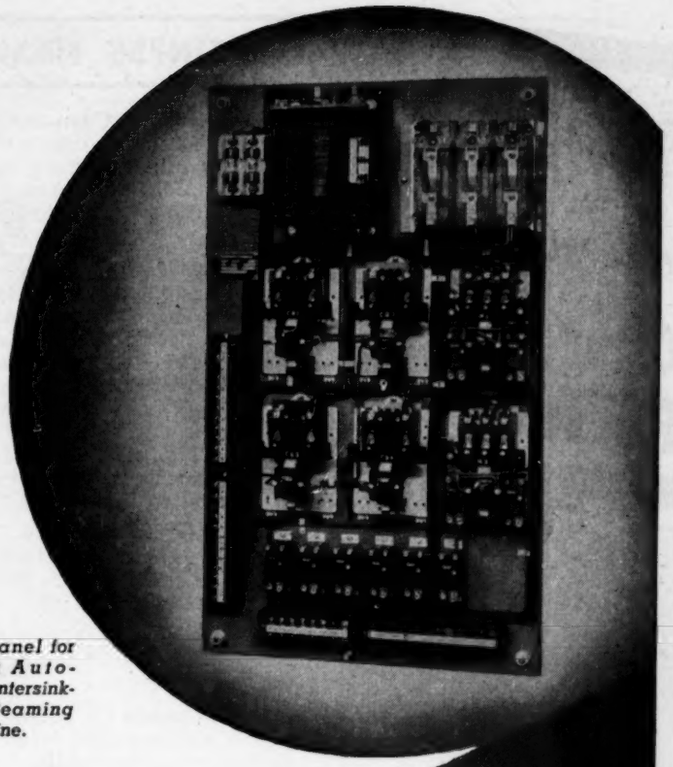
John W. Craig, works manager of the Crosley Shelvador refrigerator plant in Richmond, Ind., since 1945, has been promoted to be general works manager of the Crosley Div., Avco Manufacturing Corp., Cincinnati.

H. B. Osborn, former sales manager of the TOCCO Div. of The Ohio Crankshaft Co., Cleveland, has been appointed technical director of the division in charge of exploring and developing new fields for induction heating.

Marshall E. Munroe has been appointed tractor purchasing agent for Harry Ferguson, Inc., Detroit.

W. H. Holbert, manager of the Stuttgart, Ark., plant of Fairbanks, Morse & Co., Chicago, for the past 20 years, has been appointed manager of the Three Rivers, Mich. plant, succeeding **Karl W. Barrett,** who has resigned. **J. R. Walsh,** former assistant manager of the St. Louis Westco Works, has been transferred to Stuttgart as works manager.

Katherine N. Bartlett has been elected president of the Dobbie Foundry & Machine Co., Niagara Falls, N. Y., and Joseph P. Comer is vice president and superintendent.



Control Panel for Mohawk Automatic Countersinking and Reaming Machine.

CLARK CONTROL helps speed production of automobile door hinges

This automatic countersinking and reaming machine made by Mohawk Metal Forming and Tool Corporation uses CLARK CONTROL for fast production of automobile door hinges.

1200 to 1400 hinges per hour are reamed and countersunk on this machine. Operation is entirely automatic—pieces are fed into a jig which delivers them to the machine, and they are not touched again until assembled.

The CLARK CONTROL is specially engineered to do the entire job—but each individual piece of apparatus on the panel is standard and the whole functions as a unit—through CLARK engineering "Know-How".

Builders and users of all types of machinery find CLARK CONTROL dependable, sturdy and requiring minimum maintenance.

Contact CLARK for Machine Electrical Control.

Automatic Countersinking and Reaming Machine for Automobile Door Hinges—made by Mohawk Metal Forming and Tool Corporation.

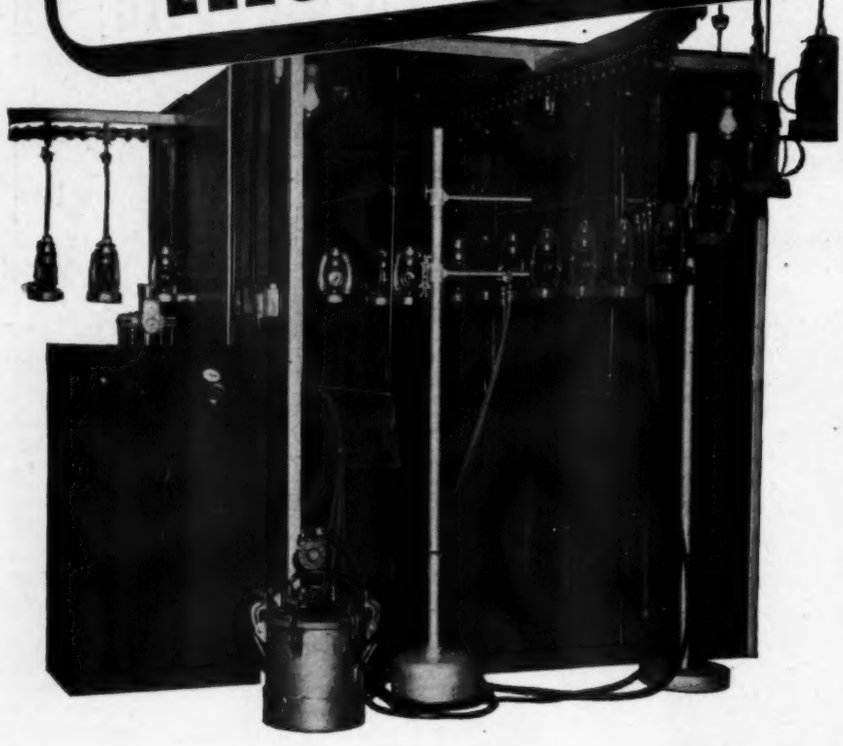
THE CLARK CONTROLLER CO.

EVERYTHING UNDER CONTROL • 1146 EAST 152nd STREET, CLEVELAND 10, OHIO

Cut finishing Costs up to 65%

—AND KEEP QUALITY CONTROL WITH

Automatic ELECTRO-SPRAY



See your product coated

IN RANSBURG LABORATORIES

● RANSBURG shows you results of their engineering and development as it applies to *your product* and *your finishing requirements.* You see every evidence of paint savings . . . labor savings . . . and increased production actually applied to your finishing operations.

RANSBURG *electro-coating* engineers work out *all* details for conversion in order that your change over can be made with a *minimum* of down time.

Further proof that Electrostatic Spray-painting has brought amazing savings in paint and labor, besides increasing production on a wide variety of products, is shown in Ransburg's Illustrated Booklet.

RANSBURG

Write for Illustrated Booklet.

RANSBURG ELECTRO-COATING CORP.

1256 Barth Ave., Indianapolis 7, Indiana

BUSINESS ITEMS

General Electric Company's Lamp Dept. will start construction of another glass tubing factory in April, near Logan, Mich. The building will cost $1,250,000 and machinery, $750,000.

Link-Belt Co., Chicago, has established a sales office in Louisville, Ky., at 136 So. Fourth St. **Emmart LaCrosse, Jr.,** formerly district sales engineer in Indianapolis, has been appointed district sales manager. The company has also opened a district office in Charlotte, N. C., at 617 Johnston Bldg., with **Thomas H. Appleton,** formerly of the Baltimore staff, in charge.

Ross Operating Valve Co., Detroit, has moved to new quarters at 120 E. Golden Gate which were purchased from the government.

Allen-Bradley Co., Milwaukee, has moved its Detroit headquarters to 11100 E. Warren Ave.

Wyman-Gordon Co. has purchased the drop hammer steel forging facilities it operated during the war from the government for $2,671,025. The firm will use it principally for the production of crankshafts.

Champion Forge Co., Cleveland, has appointed the **District Steel & Equipment Co.,** 4536 District St., Los Angeles, as its exclusive distributor in California.

Adirondack Foundries & Steel, Inc., has purchased a surplus iron and steel foundry at Watervliet, N. Y., from WAA for $257,000. $270,000 will be spent to convert the property to production of castings.

Reed Rolled Thread Die Co., Worcester, Mass., has appointed **Fred E. Duerre** of the **Production Tool Sales Co.** as its representative in northern New Jersey. His office is located at 2 No. Dean St., Englewood, N. J.

The Timken Roller Bearing Co. is leasing 50,000 sq. ft. of manufacturing space at 2300 Linden Ave., Zanesville, Ohio, to consolidate all its Zanesville operations. The quarters will be ready for occupancy shortly after May 1.

Tawco Products, Inc., has moved to 1200 Chesapeake Ave., Columbus, Ohio.

The Index Machine Co., newly-formed Jackson, Mich., firm, is now the sales representative for the **Index Machine and Tool Co.,** Jackson. The new firm will handle the complete line of Index milling machines and related equipment, formerly sold through Blank & Buxton Machinery Co., Jackson. Officers of the concern include: **G. S. Adams,** president; **Axel Swanson,** vice president; and **H. T. Andress,** secretary and treasurer.

"100" Series Ground Deep Groove Radial, Full Ball Type, Soft Outer Band, Inch Sizes.

"1200" Series, Similar "400" Series Except Double Row.

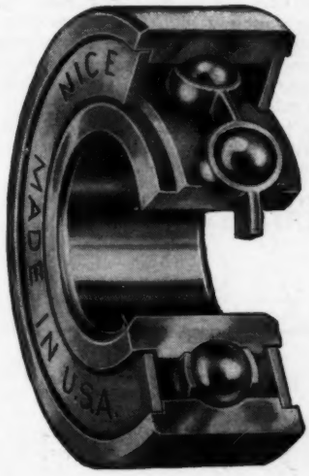
"300" Series Unground Radial and Thrust, Full Ball Type, Pressed Cone, Soft Outer Band, Inch Sizes.

"600" Series Self Contained Unground Thrust, Full Ball Type, Soft Outer Band, Inch Sizes.

Ground Thrusts, Series "1000", "1100", "2600" and "2700", with Retainer, Inch and Metric Sizes.

Consider these Facts ABOUT NICE Ball Bearings

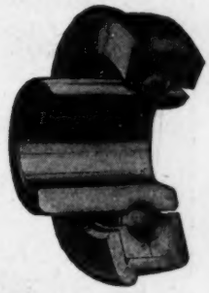
- Their inexpensive design and high rate of automatic production make for *low cost.*
- Inch standard sizes and dimensions make for simple, convenient engineering design and application.
- The soft steel outer band on many types makes a press housing fit easy and inexpensive.
- Will often readily replace common friction washers and bushings at little or no extra cost.
- Can frequently be used to replace expensive precision bearings not warranted by less exacting conditions of speed, load and accuracy.
- More than 600 "standards" and over 2000 "specials" provide for a majority of all requirements. Standards are normally available from stock.
- Almost all standards and specials can be made of special materials such as brass, bronze, Monel metal and stainless steel.
- New "specials" to meet individual requirements can be made when the quantity involved warrants tooling.



• NICE now producing "Series 1600", a new line of low cost precision radial bearings, and "Series 3000", a new line of unground "precision type" radials, as illustrated. These bearings are inch dimensioned and can be furnished with or without shields.

Write for New Catalog No. 125

"400" Series Unground Deep Groove Radial, Full Ball Type, Soft Outer Band, Inch Sizes.



"Flanged" Series, Similar "400" Series Except Outer Band Flanged.

"700" Series Unground Radial and Thrust, Full Ball Type, Solid Cone, Soft Outer Band, Inch Sizes.

"K" Series (Aircraft and Commercial) Precision Deep Groove Radial, Full Ball Type, Double Shielded, Inch Sizes.

NICE

NICE BALL BEARING COMPANY
NICETOWN · PHILADELPHIA · PENNSYLVANIA

YES, you can save up to 20% on a brand new set of Ellstrom Chromium-plated Gage Blocks simply by trading in your worn set under Ellstrom's liberal exchange plan. Here's how it works . . .

(1) If you have a used set of rectangular Ellstrom blocks, you get a 20% trade-in allowance on a brand new duplicate set.

(2) On worn rectangular blocks of any other make, you get a 10% trade-in allowance.

(3) Used sets of square type blocks bring you a 10% trade-in allowance regardless of make.

(4) Or, if you have any number of individual blocks in need of replacement, the same discounts will be allowed on the price of replacement.

NOTE: All discounts are based on existing W prices.

Under this liberal exchange plan, you can keep your old blocks until we deliver your new ones—each having the inimitable Ellstrom feature of Chromium plated gaging surfaces to assure you of longer wearing millionths!

Write today for latest Ellstrom prices and delivery schedules.

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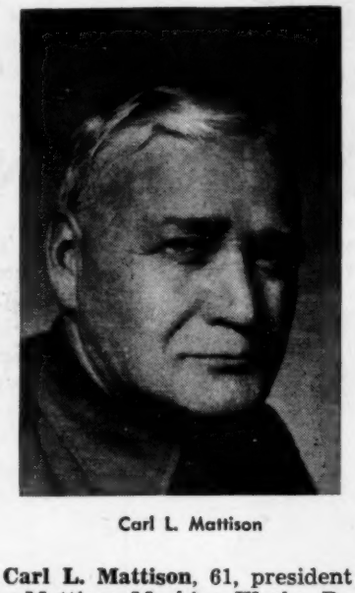
OBITUARIES



Carl L. Mattison

Carl L. Mattison, 61, president of the Mattison Machine Works, Rockford, Ill., since 1939, died March 3. During his career he helped develop many woodworking machines and machine tools.

Martin Newcomer, 64, assistant director of research of The Winchester Repeating Arms Co., div. of Olin Industries, Inc., died suddenly Feb. 24.

Frank R. Fretz, 68, industrial engineer with the Trundle Engineering Co., Cleveland, for the past 15 years, died March 1. He was previously associated with the Baldwin Locomotive Works, Philadelphia, Warner & Swasey Co. and the Cleveland Tractor Co., Cleveland.

Robert J. Murray II, 46, secretary-treasurer of the Jessop Steel Co., Washington, Pa., died Feb. 23.

MEETINGS

American Foundrymen's Association. Convention and foundry show. Convention Hall and Commercial Museum. Philadelphia, Pa. May 3-7. William W. Maloney, secretary-treasurer, 222 W. Adams St., Chicago 6.

Society for Experimental Stress Analysis. Annual meeting. The Roosevelt Hotel, Pittsburgh. May 27-29. W. M. Murray, secretary-treasurer, P. O. Box 168, Cambridge 39, Mass.

The Society of Plastics Industry. Annual meeting. Ambassador Hotel. Atlantic City, N. J. May 20-21. William T. Cruse, executive vice president, 295 Madison Ave., New York 17.

Westinghouse Machine Tool Forum. Hotel Statler, Buffalo, N. Y. April 22-23.

FREE LITERATURE

New Catalogs, Booklets, Bulletins

(Not good after May 1, 1948)

MACHINES AND ATTACHMENTS

1 BORE-MATIC VERSATILITY—Heald Machine Co., Worcester, Mass. 192-page book 4049-95033, spirally bound with hard cover, contains in three sections 27 tooling setups for single-end Bore-Matic with one boring head, 21 tooling setups for two or more boring heads, and 23 tooling setups for double-end machine with two or more heads. Book will be sent only to planning engineers in mass-production shops.

2 METAL STITCHER—Acme Steel Co., 2840 Archer Ave., Chicago 8, Ill. Single-page insert gives specifications and illustration of Acme-Morrison metal stitcher. Insert includes list of maximum production penetrations in various materials.

3 RADIAL DRILLS—Western Machine Tool Works, Holland, Mich. 12-page bulletin 4431 illustrates and describes 12-speed, high-speed radial drills, ball bearing equipped. Specifications are included.

4 FACE GRINDING—Diamond Machine Co., Philadelphia 25, Pa. 4-page folder 44-G gives information on face grinding flat surfaces with the Diamond face grinder. Specifications and illustrations are included.

5 GRINDING, POLISHING—Minnesota Mining & Mfg. Co., St. Paul 6, Minn. 16-page bulletin called "Step Up Production," features the 3M backstand method, and gives case histories of various plants.

6 BALANCING MACHINES — Bear Mfg. Co., Rock Island, Ill. 4-page folder illustrates and describes Dy-Namic balancing machines for balancing rotating parts, from tiny armatures to parts weighing thousands of pounds.

7 TAPPING MACHINES — Procunier Safety Chuck Co., Chicago 6, Ill. Two 4page folders, A-47 and D-47 illustrate and give specifications on the Universal Series A, and Series D tapping machines, respectively.

8 DRILLPRESSES—Delta Mfg. Div., Rockwell Mfg. Co., Milwaukee 1, Wis. 12-page bulletin A-17 contains specifications and illustrations on their 17-in. drillpress. Various types are described.

9 CARBIDE TOOL GRINDER—Hammond Machinery Builders Inc., Kalamazoo 54, Mich. 12-page bulletin 220 covers with illustrations their line of wet and dry carbide tool grinders, chip-breaker tool grinders and diamond-finishing tool grinders.

10 DRILLING MACHINES — Sibley Machine and Foundry Corp., South Bend, Ind. Catalog 67 illustrates and describes Model C-20 drilling machine. Listed are features of construction and design. Geared tapping head with electrical reversing is also described.

11 DRILLING, GRINDING ATTACHMENT—Versa-Mil Co., New York 7, N.Y. 8-page bulletin describes the varied uses of the Versa-Mil, a machine tool auxiliary for precision milling, drilling and grinding. Unit can be mounted on the carriage of a lathe.

TOOLS AND ACCESSORIES

12 GAGES—Cavalier Gage Co., Poughkeepsie, N. Y. 67-page catalog spirally bound with removable pages covers the line of gages including dial snap gages, plug gages and cylindrical ring gages. Complete specifications are included.

13 PRESS FEEDER—Covert Mfg. Co., Troy, N. Y. 8-page bulletin covers the Feed-O-Matic, a mechanical hand said to increase punch-press production on secondary work. Unit can be applied to any power punch press.

14 AIR-OPERATED DEVICES—Mead Specialties Co., Chicago 41, Ill. 36-page booklet covers the varied devices with specifications and applications. Included are their air clamps, air vises, collet fixtures, and others.

15 SLITTING SAW BLADES—Motch & Merryweather Co., Cleveland 13, Ohio. 4-page folder gives features of line of slitting saw blades for milling operations. Advantages mentioned are triple-chip efficiency, dual drive, interchangeability, and range of pitch.

16 COLLET CHUCK—Porst Bros., Chicago 12, Ill. Folder explains the Levermatic collet chuck and lists the construction features, with dimensions and specifications.

17 WRENCH—Efco Mfg. Co., Hamilton, R.I. 4-page folder describes the open-end speed wrench which operates inside 60° angles without removing jaws from work. Seven interchangeable heads fit in one handle.

18 ROLL FEEDS—Wittek Mfg. Co., Chicago, Ill. 24-page pamphlet WF-399 lists various models of roll feeds for punch presses with schematic diagrams. Line of real stands is also described.

19 OPERATION RECORDERS — The Esterline Angus Co., Inc., Indianapolis 6, Ind. 16-page bulletin 247 entitled "Operation Recorders—Their Selection and Use," gives general description, types of records, methods of actuating and other information.

20 RECESSING TOOLS—Maxwell Co., Bedford, Ohio. Illustrated pamphlet R-246 covers line of recessing tools with detailed drawings. Tools are adaptable to drillpresses, boring mills, turret lathes and other machines.

HEAT-TREATING AND WELDING

21 ISOTHERMAL HEAT - TREAT - MENT—Ajax Electric Co., Inc., Philadelphia 23, Pa. 4-page folder 120 covers Ajax isothermal quench furnaces and includes information on martempering and austempering, and isothermal treatment of carburized work.

22 CARBURIZING ANNEALING BOXES—Michiana Products Corp., Michigan City, Ind. 24-page catalog lists variety of available patterns for carburizing boxes, annealing boxes, rgtorts and other heat-treating containers as well as centrifugal cast tubes. Dimensions are given.

Example

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23 ARC WELDERS — Hobart Bros., Troy, Ohio. 36-page catalog contains illustrations, descriptions, dimensions and specifications on its line of "Simplified" arc welders.

24 INDUCTION AND DIELECTRIC HEATING—Westinghouse Electric Corp., Industrial Electronics Div., Baltimore 3, Md. 36-page booklet 3620-A covers induction and dielectric heating, applications and equipment.

25 WELDING PRODUCTS — Amsco Div., American Brake Shoe Co., Chicago Heights, Ill. 26-page bulletin 1047-W gives specifications of line of electrodes and welding rods, including stock sizes, identification, and current.

26 ARC WELDERS—Marquette Mfg. Co., Inc., Minneapolis 14, Minn. 4-page folder and two single-page inserts cover with illustrations the different ac. models designed to strike a quick arc without the use of high-frequency or booster attachments.

PLANT SERVICE EQUIPMENT

27 TRUCTRACTOR—Clark Equipment Co., Battle Creek, Mich. 8-page bulletin TQ-45 illustrates and describes the Pul-Pac tructractor for lifting, stacking and carrying without the use of pallets.

28 CRANES, TROLLEYS—Conco Engineering Works, Mandota, Ill. 8-page pamphlet 3000 covers company's line of materials handling equipment including electric overhead traveling cranes, trolleys, electric hoists.

29 CONVEYOR SYSTEM — Standard Conveyor Co., North St. Paul., Minn. 20-page booklet 110 describes with drawings the Standard Handi-Drive for making custom-built conveyor systems from stock units.

30 LIFT TRUCKS—Ross Carrier Co., Benton Harbor, Mich. 16-page pamphlet LT contains information for handling and stacking heavy loads indoors and out with Ross pneumatic tired lift trucks. Pamphlet is fully illustrated.

31 ELECTRIC HOIST—Coffing Hoist Co., Danville, Ill. Four 4-page folders include the Mighty-Midget puller, the Quick-Lift electric hoist, Hoist-Jack, and lifting and pulling equipment.

32 CONVEYORS — Standard Conveyor Co., North St. Paul, Minn. 26-page catalog 308 illustrates and describes Standard gravity and power conveyor and dispatching systems.

33 CONVEYOR—Link-Belt Co., Chicago 1, Ill. 48-page booklet 2175 contains information on the Bulk F-10 combination elevator, conveyor and feeder. Charts and tables for determining size and speed are given.

34 CONVEYOR—J. W. Greer Co., Cambridge 39, Mass. 10-page bulletin 45-3 illustrates and describes the Greer Multi-Tier conveyor for continuous straight-line production. Unit may be loaded automatically or by hand.

35 CRANE CONTROL—Harnischfeger Corp., Milwaukee 14, Wis. 6-page folder C-39 explains the P & H Magnetorque crane control said to eliminate mechanical load brake.

36 GRAVITY ROLLER CONVEYORS —Harry J. Ferguson Co., Jenkintown, Pa. 12-page bulletin 100 covers the Streamliner gravity roller conveyors. Complete line is included.

37 PRIME-MOVER — Bell Aircraft Corp., Buffalo 5, N. Y. 8-page folder contains information and illustration of uses of the Prime-Mover. Unit is convertible from bucket to platform type.

38 LIFT TRUCK PLATFORMS—Powell Pressed Steel Co., Hubbard, Ohio. Folder includes four bulletins on line of material handling equipment. Lift-truck platforms, pallets, special handling equipment, and all steel collapsible container are covered.

PARTS AND MATERIALS

39 CAST BRONZE-BEARING ALLOYS —Bunting Brass & Bronze Co., Toledo, Ohio. First of a series of technical papers on physical and metallurgical properties to assist in selecting proper alloy for a given type service.

40 PUMPS—John Bean Mfg. Co., Lansing 4, Mich. 8-page pamphlet L-623 describes with illustrations industrial high-pressure pumps including plunger cup packing type.

41 AC GENERATORS—Electric Machinery Mfg. Co., Minneapolis 14, Minn. 16-page Synchronizer folder entitled "How to Apply Packaged A-C Generators", with 7 tables for generator and wire selection.

42 CAPACITORS—Cornell-Dubilier Electric Corp., South Plainfield, N. J. 24-page booklet 200 illustrates with drawings more than 20 classes of capacitors. Construction details are incorporated.

43 MOTORS—Haydon Mfg. Co., Inc., Torrington, Conn. 16-page bulletin 320 covers timing motors and devices, with complete listings of speeds, voltages, frequencies and other variations.

44 ELECTRIC PRODUCTS — Federal Electric Products Co., Newark 5, N. J. 102-page catalog 107 covers Federal line, including motor controls, safety switches, service equipment, circuit breakers, and other items.

45 TRANSFORMERS—Raytheon Mfg. Co., Waltham 54, Mass. 4-page folder DL-K-301 gives information on company's line of transformers. All transformers are built to customers' orders.

46 ALLOY—Ampco Metal, Inc., Milwaukee 4, Wis. 24-page booklet 88 describes and gives uses of Ampcoloy 49, an aluminum bronze cold-heading alloy, which is available both as rod and wire.

47 MAGNESIUM—Brooks & Perkins, Inc., Detroit 1, Mich. New house organ gives data on the applications and processing of magnesium.

48 PERFORATED MATERIALS—The Harrington & King Perforating Co., Chicago 44, Ill. 128-page catalog 62 spirally bound lists varied types available with specifications, as well as data on fabrication.

49 RUST-OLEUM—Rust-Oleum Corp., Evanston, Ill. 34-page catalog gives specifications as well as applications of each product. Material is available in different finishes.

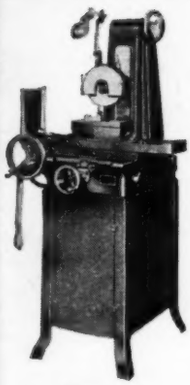
50 STAINLESS STEEL TUBING—The Carpenter Steel Co., Alloy Tube Div., Union, N. J. 92-page data book gives detailed information on selection, fabrication and use of stainless steel tubing and pipe.

51 STEEL CATALOG—Latrobe Electric Steel Co., Latrobe, Pa. 80-page spirally bound pocket catalog condenses descriptions, and heat treatment and application data. Classifications include high-speed, non-deforming, oil-hardening, hot-work, shock and chisel, diecasting, water-hardening and carbon steels.

52 BOLTS, NUTS—Sterling Bolt Co., Chicago 6, Ill. 124-page catalog spirally bound provides information on bolts, cap, set and thumb screws, nuts, rivets, washers and other products made by the company. Complete specifications are given.

53 GEARS, SPEED REDUCERS, COUPLINGS—The Falk Corp., Milwaukee 8, Wis. 12-page bulletin 10,000 describes and illustrates all Falk precision products including gears, speed reducers, motoreducers, couplings, high-speed drives, and others.

MATTISON GRINDER SAVES TIME BY GRINDING V AND FLAT WAYS WITH SAME WHEEL ON SPECIAL FIXTURE



Practically all finished surfaces of the No. 612 **Boyar-Schultz** grinder shown at left are ground on the Mattison High-Powered Precision Surface Grinder.

Write for Free Set-Up Book showing how others have reduced time and cut costs with Mattison Grinders.

The illustration above shows a Mattison High Powered Precision Surface Grinder in the plant of **Boyar-Schultz Corp.** finishing V Ways of grinder table to precise accuracy and a fine finish. Work is held in special indexing fixture so that V and flat ways are ground with periphery of a standard grinding wheel. Considerable time is saved as no time is required for changing wheels, bevel dressing, etc. The scraping operation is eliminated. Surfaces of ways are finished parallel and flat to within .0002.

The bottom of table is ground on another fixture with similar results. Other parts finished include base-cover plates, columns, cross feed carriage, etc.

Here is an example showing how costs can be reduced through the use of the Mattison Grinder. For further examples ask for a free copy of the Mattison Set-Up Book.

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Take advantage of Niagara factory regrinding service by the same skilled men and on the same precision machines used in making Niagara Knives.

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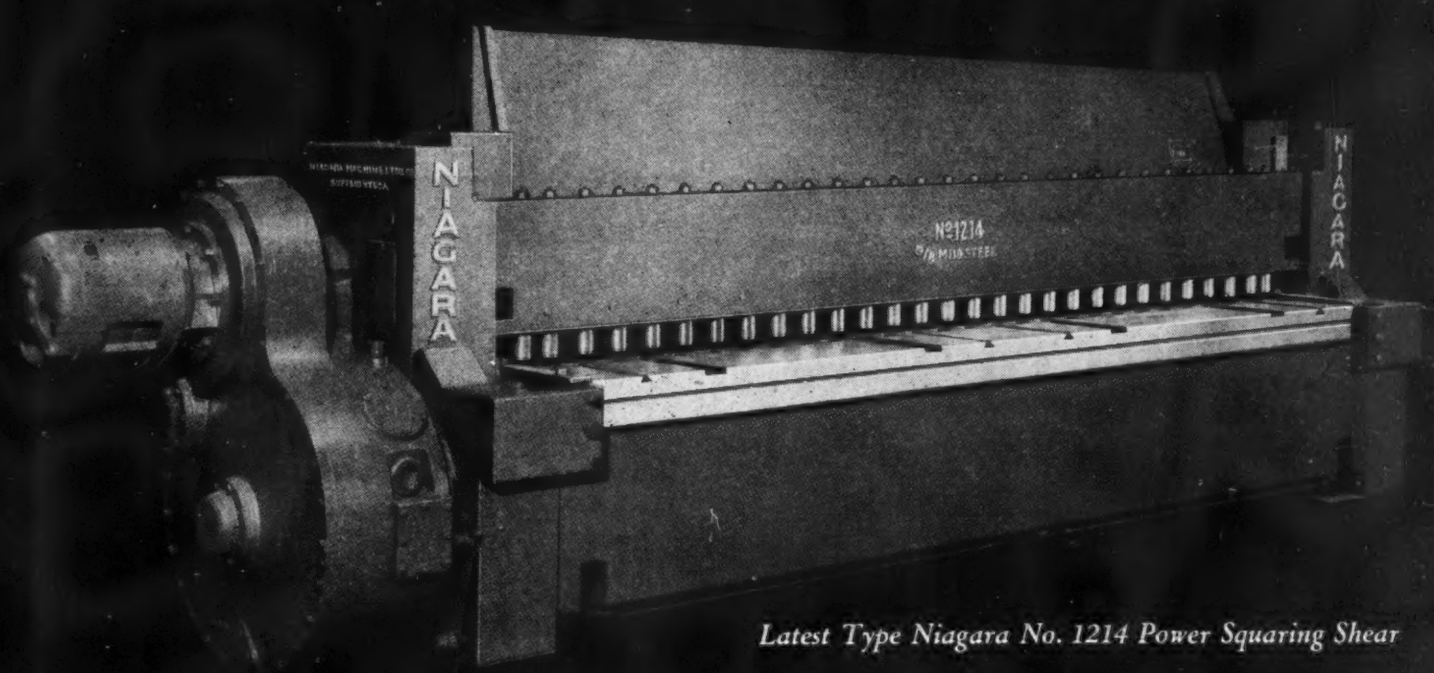

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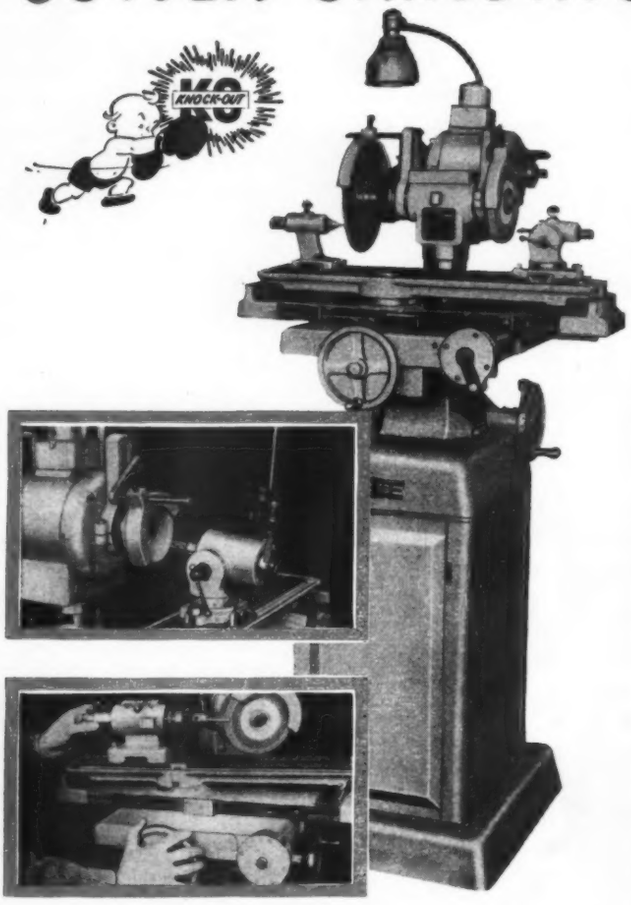

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UNITED STATES STEEL

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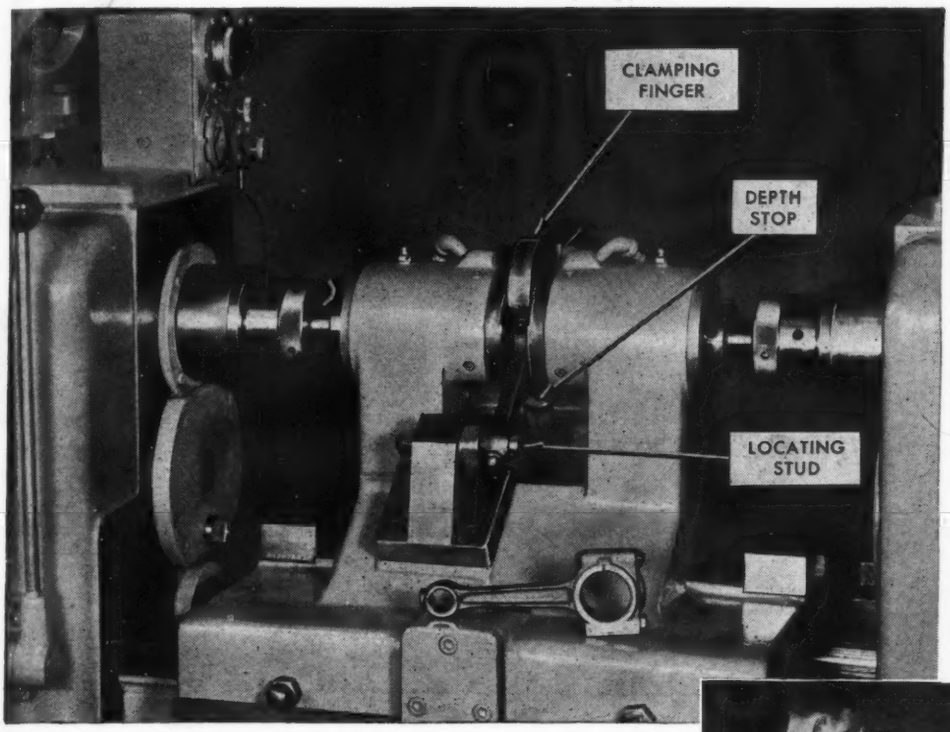
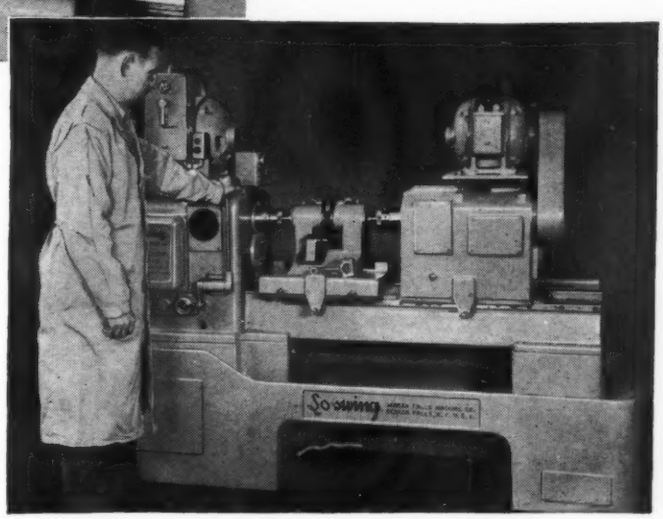
PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK



Model "CS" Lo-swing Automatic Drilling and Centering Machine Cuts Costs on Chamfering Connecting Rod Main Bearings



Problem: To automatically chamfer both sides of connecting rod main bearings. Chamfer must be smooth and free from chatter marks.

Solution: The Model "CS" Lo-swing Automatic Drilling and Centering Machine selected for this job, is equipped with one fixed and one adjustable drilling and centering head and a special automatically-operated holding fixture. The holding fixture, shown in the close-up illustration is fitted with a locating stud which holds and locates the connecting rod on the wrist pin hole. After mounting the part on this stud, it is necessary only to swing the large end of the connecting rod between two hardened steel bushings which hold the rod endwise, and a depth stop positions the hole axially with the chamfering cutters.

The air-operated clamping finger, shown just above the connecting rod, is automatically operated through an air valve controlled from the feed mechanism and is automatically closed when the machine is started and automatically opened at the end of the machine cycle.

The machine cycle is entirely automatic; the operator simply loads the parts and pushes the starting lever which also actuates the clamp. The chamfering cutters advance in rapid traverse to the cutting position, slow down for feed and then return in rapid traverse to the starting position, where the clamp is automatically opened.

Principal production advantages are:

1st. Operator cannot forget to clamp the work as it is automatically clamped.

2nd. Operator is free to run other machines due to the rapidity of loading and unloading.

3rd. Amount of chamfer is constant. Stroke controlled by positive path cams.

4th. Production on an average size connecting rod is 300 pieces per hour!!!

PRODUCTION COSTS ARE LOWER WITH Lo-swing

PRICE TAGS of QUALITY

Adjustable MULTIPLE DRILL HEADS

Fit any machine, 2 to 10 Spindles.
Save 2 to 10 Operations.

PRICES

U-1	3 Spindle Head	$150.00
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	5 " "	160.00
	6 " "	170.00
	7 " "	180.00
	8 " "	200.00

6" DRILLING AREA
¼ capacity
21/32 center

PRICES

U-2	3 Spindle Head	$177.00
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	5 " "	231.00
	6 " "	258.00
	7 " "	285.00
	8 " "	312.00
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10" DRILLING AREA
½ capacity in cast iron standard
¾ special adaption in cast iron

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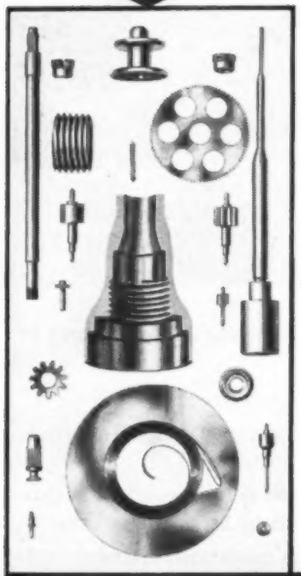

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Continuous tooth

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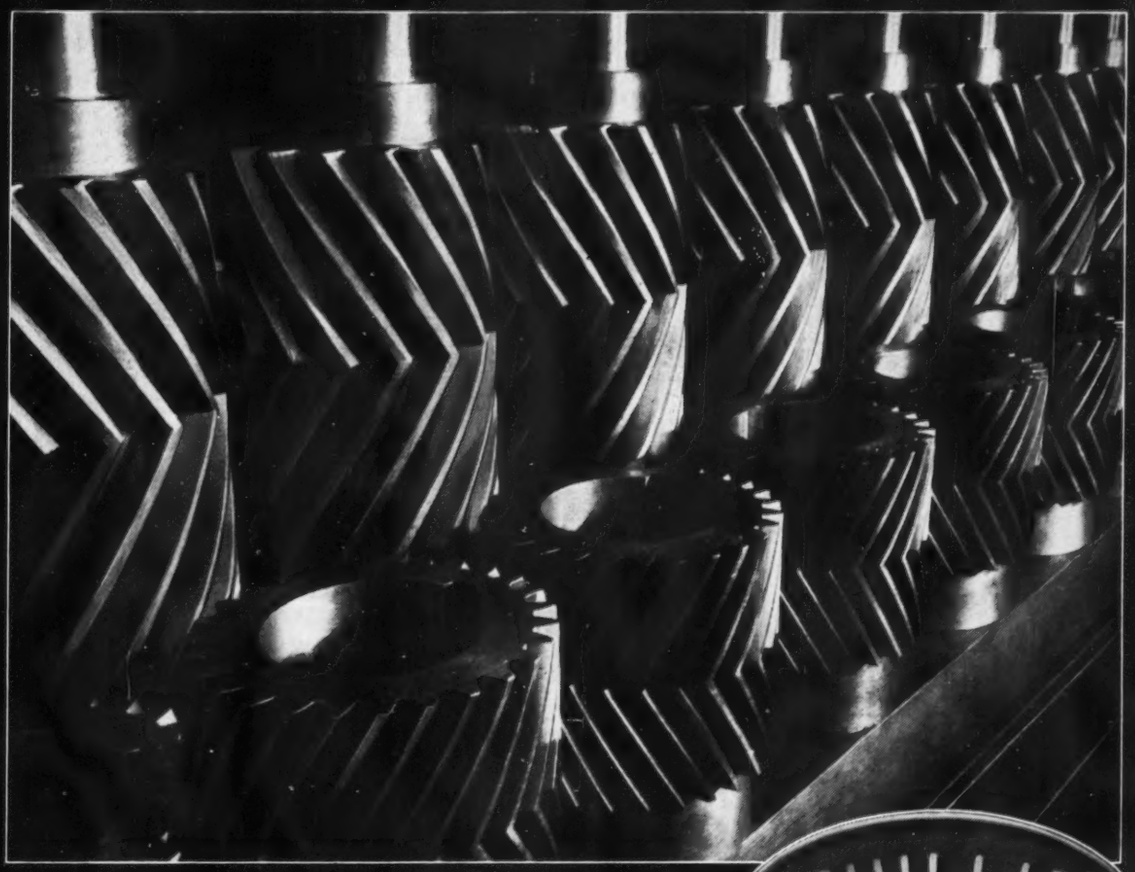

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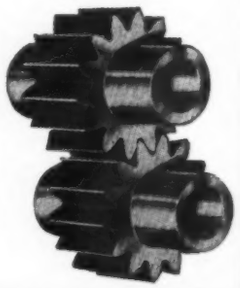

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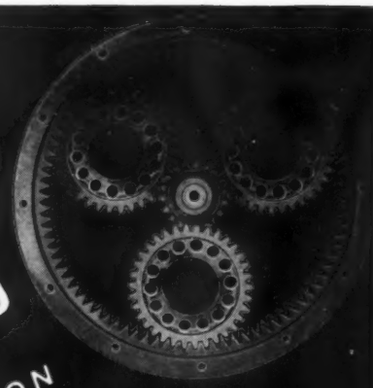

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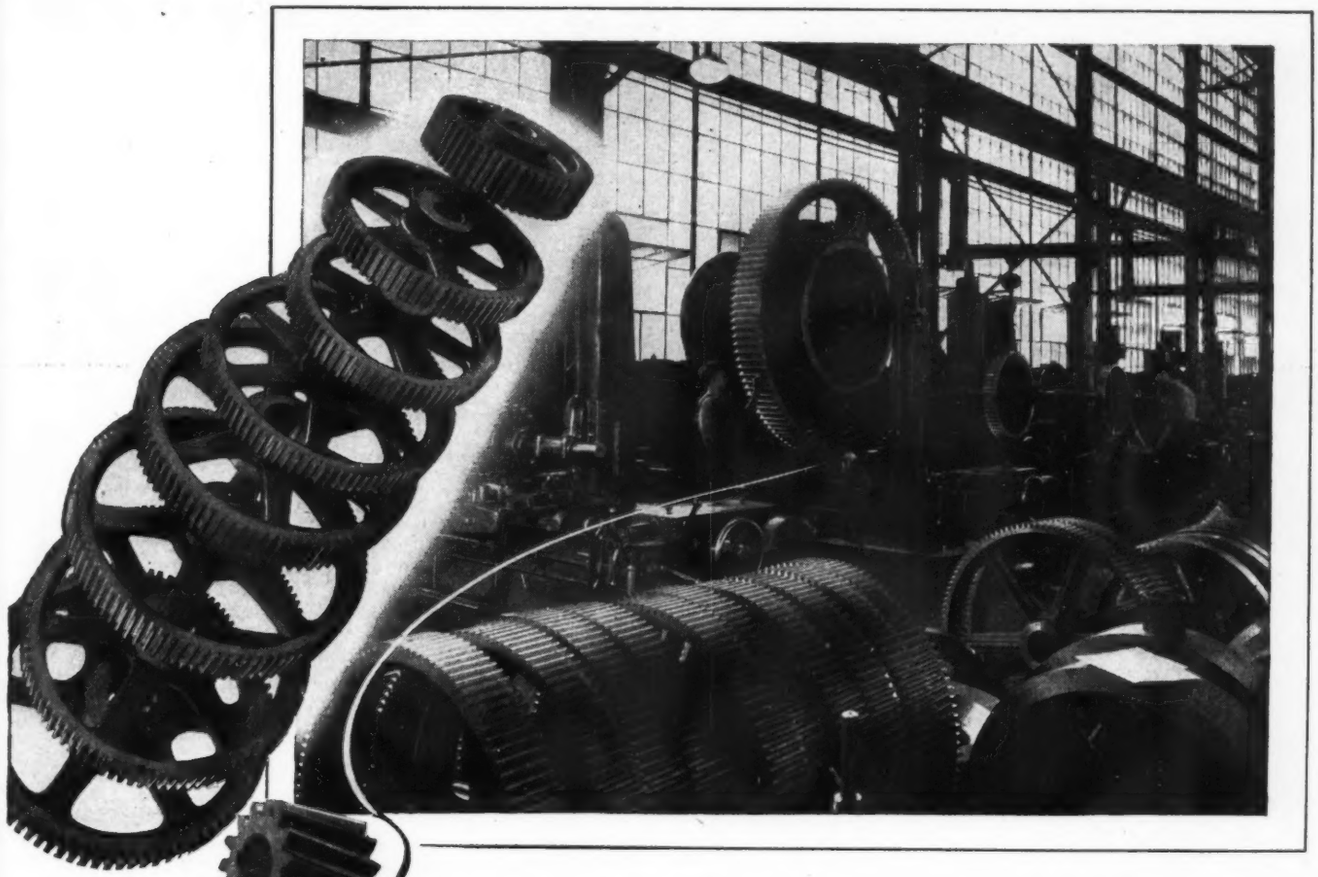

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QUICK CHUCKING
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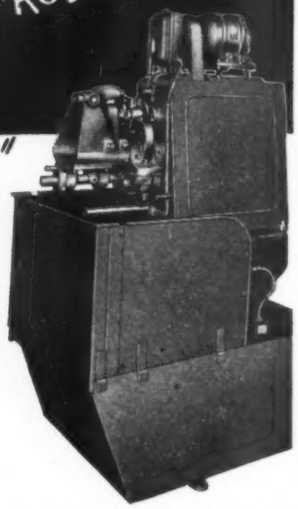
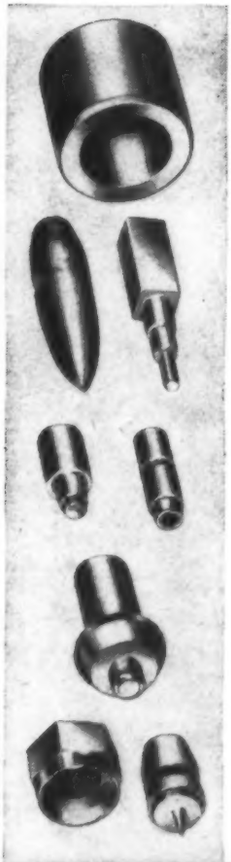
"Standard"

AUTOMATIC
SCREW MACHINE
No. 2

Pat. No. 2,373,155 April 10, 1945



"Standard" Automatic with drilling attachment, fabricated base, coolant tank and splash guards.



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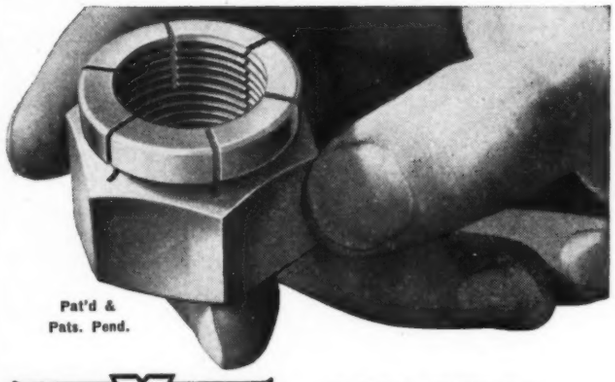

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The 988 working drawings in this book, with their concise explanations, show you at a glance what you want to know on the design, construction, and use of any piece of tooling equipment. Here is a wealth of up-to-date, useful data not only on jigs and fixtures but also on machine tools, diemaking, plastic molding, welding and other allied tools and procedures used by industry today. "The drawings are unusually well executed. Offers toolmakers a quick reference; many ideas of use to engineers in other fields." —*The Tool Engineer.* $7.50

Simplified Punch & Diemaking

By Walker & Taylor

Written by two widely experienced toolmakers, this book gives you the latest information on the methods and materials for the design and construction of all types of punches and dies for fabricating sheet metal, together with clear how-to-do-it instructions. A complete, easy-to-follow guide for the novice and a full, up-to-date handbook for tool and diemakers. Includes full reference tables and a handy summary of important facts. 254 illus. $5

Machine Shop Operations

1. Lathe Operations, $1.75;
2. Milling Machine Operations, $1.75;
3. Shaper Operations, $1.00;
4., 5. Bench, Grinder Operations, preparing.

These manuals provide all the technical information needed to perform skillfully each operation on each of the major machine tools. Clear explanation of all necessary calculations, tables of data, and the precautions and "tricks of the trade" practiced by expert machinists are included. Thoroughly and clearly illustrated with large detail drawings and photographs of standard equipment in use.

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The Macmillan Co., 60 Fifth Ave., N. Y. C. 11

Please send me the books checked below on 10 days' approval, with the privilege of returning them without charge.

☐ **Illustrated Jig-Tooling Dictionary**
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Machine Shop Operations: 1. 2. 3. 4. 5.

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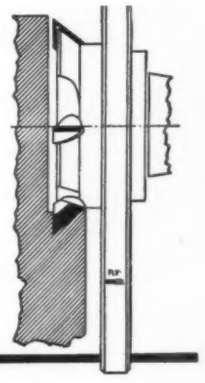
Company.....

Compare THESE RESULTS WITH YOUR BEST!

New Lovejoy Dovetail Cutter

The NEW Lovejoy Dovetail Cutter offers a faster and more economical method for forming dovetails, milling vee-slots or cutting angles. The following performance data is typical of the results which can be expected—compare it with your best!

OPERATION:	*Milling Dovetail Slots*
MATERIAL:	*Cast Iron*
FEED:	*13 Inches per Minute*
SPEED:	*200 R.P.M.*
DEPTH OF CUT:	*½ inch*
TIP MATERIAL:	*883 (Tungsten Carbide)*



PERFORMANCE: The 6" Lovejoy Dovetail Cutter has 6 blades and is run with 70 lb. Lovejoy Flywheel. The cutting action is free and even, finish very smooth. After running 1400 lineal inches to complete the job, the blades showed negligible wear.

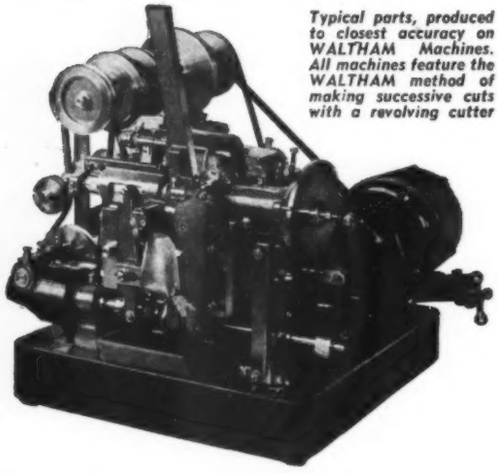
"TOOL BITS"

The job described above brings up the subject of Flywheels. When are they necessary? There is no standard rule, but it is well to study possible advantages when cutters are light in weight or of small diameter. They are of special value when cutting steel. Lovejoy manufactures a complete line of flywheels for any machine spindle for driving bolt-on mills or National Standard arbors. We will be pleased to make recommendations based on the following information—machine, make, material to be cut, blade material, etc.

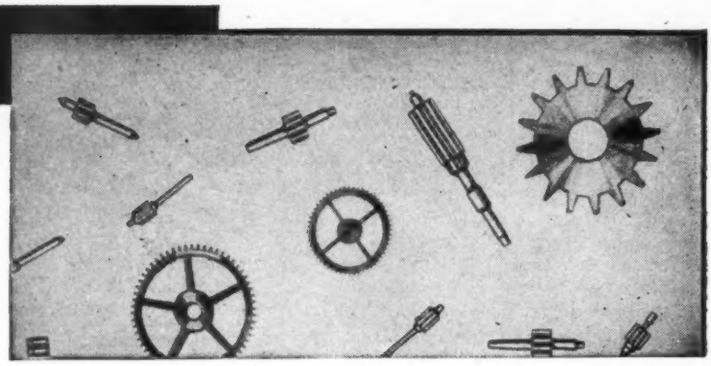
Lovejoy
TOOL COMPANY, INC.
SPRINGFIELD, VERMONT

WALTHAM
PINION & GEAR CUTTING MACHINES

for precision production of fine pitch mechanisms



Typical parts, produced to closest accuracy on WALTHAM Machines. All machines feature the WALTHAM method of making successive cuts with a revolving cutter



Single-Cut Pinion Machines This machine employs one cutter. Blank is positioned and machine started by hand, all other movements being automatic.

Multiple-Cut Pinion Machines Two or three cutters on arbor of cutter spindle make successive cuts. Machine stops on completion of last cut.

Magazine-Fed Pinion Machines Provides continuous production of one kind of pinion. Magazine is loaded and all other operations including cutting and ejecting are automatic and continuous.

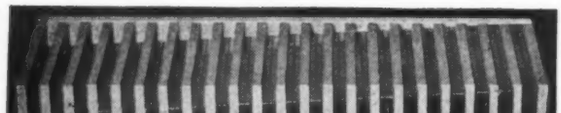
Gear Cutting Machines Single and Multiple cut machines equipped with special cutter swing provide the means of cutting teeth on gears up to 1½" pitch diameter and in a stack ¾" to 1" long.

Write for literature giving detailed specifications

WALTHAM MACHINE WORKS
WALTHAM, MASS.

WALTHAM
TRADE MARK REGISTERED U.S. PAT. OFF.

ANTON PARALLELS



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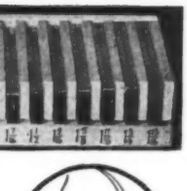
they fill a long-felt need



Parallels used in grinding operation.

Anton Parallels can be used profitably in any shop because they have wide utility and are moderately priced. They are guaranteed to come within the following specified limits of accuracy: .001" in size; .0001" in parallelism and straightness within length. Rockwell "C" hardness: 65 up.

These gages can be depended on for permanent straightness and accuracy.

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Scientifically made of selected steel under modern processes. Long lived, economical, accurate. Details on request.

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for heavy blanking and forming

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Sturdily constructed with either solid frame or built up with tie rods. Small elastic deflections do not affect tool alignment. All stresses taken centrally. Made also with wedge adjustment for slide for very close work.

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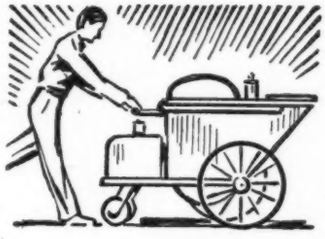
For particulars and prices, fill out and mail the coupon.

Honan-Crane SUMP CLEANER



Rugged, field-proved—this Sump Cleaner has every desirable feature to make the cleaning of machine tool sumps *easy*. It is equally suitable for quench tanks and other tanks that collect contamination. It greatly reduces labor costs for sump cleaning.

The strong vacuum pump provides a suction that will pull out abrasives, dirt, scale and other heavy contamination from far below the floor level.

The operation is simple. Your one man operator flips a switch, inserts the hose nozzle in the machine sump or tank and moves the nozzle around to collect contamination.

Salvable oil, coolant or other liquid thus collected can be drained from the Sump Cleaner tank through a convenient drain valve—or by operating a simple, three-way valve, oil or liquids can be forced out of the Sump Cleaner tank through the hose. Easy dumping arrangement permits tilting the Sump Cleaner tank forward on the axle to empty dirt, chips or scale which settle to the bottom of the tank.

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A Quick, Smooth, Uniform coating—assured by
BARRETT GALVANIZING AND HOT TINNING CENTRIFUGALS

BARRETT CENTRIFUGAL GALVANIZER is driven with high torque head and has an equalized disc brake for quick stop.

With the Barrett Whizo Galvanizer, excess metal is quickly removed from small parts after dipping in molten metal, in fact, much faster and more uniform production is assured. Parts will also pass the most rigid inspection for quality.

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A quick pick up and stop (from 2 to 3 seconds each) assures maximum production with an even thickness of coating.

Machines furnished with or without heated surrounding drum, in capacities from 40 to 240 loads per hour, handling from 5 to 100 lb. loads. When used for tinning threaded work, rethreading has been found to be unnecessary.

Barrett Centrifugals are used extensively, combine speed with convenience of operation and the utmost in safety. They are highly developed to meet all reasonable requirements, have self-contained motor drive and occupy a minimum of floor space.

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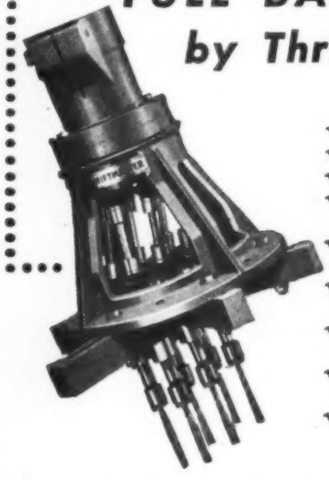
Designers and Builders of Centrifugal Machinery

NEW ADJUSTABLE DRILLHEAD
..... FULL BALL BEARING
by Thriftmaster .....



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- √ Universal Joint drive.
- √ Flexibility of operation.
- √ Unusually strong construction.
- √ High overload capacity throughout.
- √ Special alloy, test hardened gears, and spindles.
- √ Made for right hand rotation of drill press.
- √ Sufficiently rugged for use with power feed.
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- √ Furnished with 2—6 spindles, minimum 1⅛" center spacing within 6¼" diameter circle.

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THESE *dial feed* PRESSES

➧ STEP UP PRODUCTION 3 TO 6 TIMES

➧ CUT COSTS AS MUCH AS 75%

➧ MAKE HIGH SPEED OPERATION SAFE

Federal Dial Feeds are known for fast, safe, smooth operation. Everywhere you'll find them producing scores of special items which formerly required special machinery of limited utility—at the same time increasing production as much as 3 to 6 times! High speed, accuracy and reduced maintenance can save up to 75% in production costs depending on type of work. These presses can be indexed to give either long or short dwell of the dial. Positive locking mechanism smooths out the dial action (cannot skip or coast by station), adding to safety of the operator. Federal Dial Feeds—built to stand up under hardest usage—may help solve your production problem. Write for catalog on complete line.

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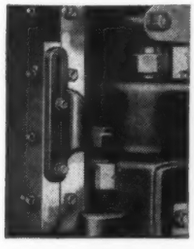
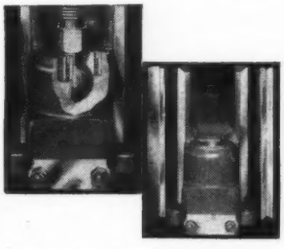
Available in 8 sizes—Capacity 6 to 80 tons.

OTHER FEDERAL COST-CUTTING FEATURES

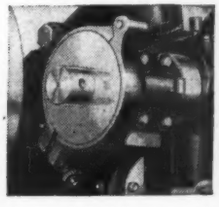
All Federal Presses may be reclined from the front—adjustment made quickly and easily by one man. Lock bolts hold press in desired position.



Knockout bracket is anchored to frame. Result: no danger of misalignment due to knockout bar impact. This reduces time out for adjustment, cuts costs.



The ram on Federal Presses is symmetrical, giving equal distribution of weight and balance; it is bored in exact alignment with "V" ways. Such careful construction adds to accuracy, speed and efficiency of press.



Shock from thrust and return strokes is transmitted to frame—no strain on bearings and caps. Brakes (spring tension) are quickly, easily adjusted.

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THE WORLD'S FINEST MULTIPLE SPINDLE

Chucking Machines

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fluid type - water soluble
For Grinding and Cutting

Rapid stock removal—
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All Baumbach Die-Sets have demountable Leader Pins and Bushings. This exclusive feature permits removing Leader pins for machine work on the die shoe and assures reassembly without loss of alignment. A big time and trouble saver. Write for Catalog.

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Patented Cutting Off Blades

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RIVETERS — PIONEERS in their line—head rivets from smallest to ⅝" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

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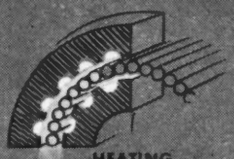
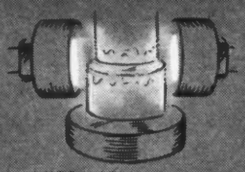


HEATING FOR FORGING

Precision end heating of bar stock for high-production forging.



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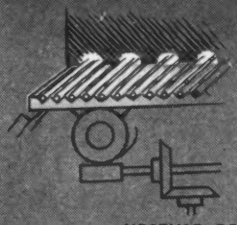

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IMPROVED HEAT PROCESSING

GRADIATION IS A SELAS TRADE NAME

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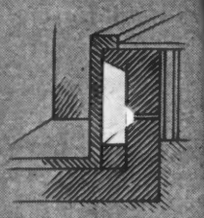
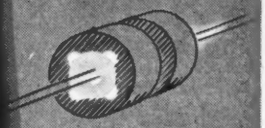


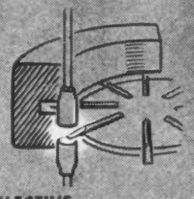
MELTING

Pot heating with extended container life.



IN-LINE HEATING

Steel and alloy tubing, ¼" up to 10" diameter, at mill speeds.



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Automatic selective hardening of sprockets, gear teeth, hammer heads, cutting tools, cam shafts.

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Continuous fast heating before and after welding.

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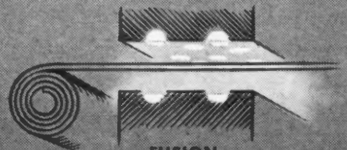
Fast successive hardening and tempering of carbon steel bars.

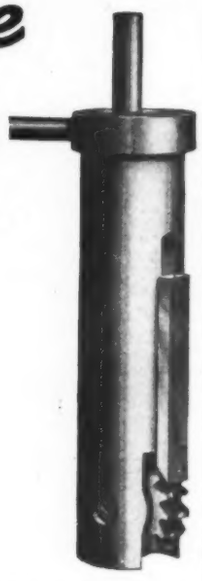


FUSION

Tin fusion of strip at 500 feet per minute and up.

Investigate

THE POSSIBILITIES OF THE NATIONAL KEYSEATING MILLER *on Your Work*



• Shops all over the country are solving difficult keyseating problems by chucking this attachment on their drill presses, radials and horizontal boring mills—and milling keyseats in pieces too large or bulky for convenient handling on keyseating machines.

The "National" goes through the hole once and mills keyseats with parallel sides and parallel with the axis of the bore. It's a big time and money saver and is available in standard stock diameters from ½" to 3½" for cutting lengths from 1⅞" to 12". It will keyseat in blind holes, and offset holes. We also manufacture oil-grooving millers.

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Several widths of cutters can be used with each size miller and many different hole diameters keyseated with one tool through the use of eccentric bushings.

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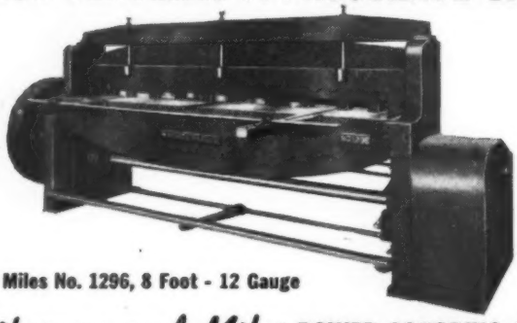

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with *Wysong and Miles* POWER SQUARING SHEARS

Cut shearing overhead on metals up to 10 gauge with *Wysong and Miles* Power Squaring Shears. Balanced semi-steel construction insures accurate alignment. Precision features cut down shearing time and give accurate work.

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Individual spring activated plunger in each foot firmly clamps full sheets or small strips that come only under one plunger.

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Ball-bearing, parallel back gauge is quickly adjusted to .0078 (1/128th) of an inch by a handwheel dial reading.

MULTIPLE DISK CLUTCH
Treadle activated friction clutch gives quick pick-up with a minimum jar. Clutch has a non-repeat safety feature.

Other fine Wysong and Miles Squaring Shears in 10, 12 and 14 gauge. Write for complete information.

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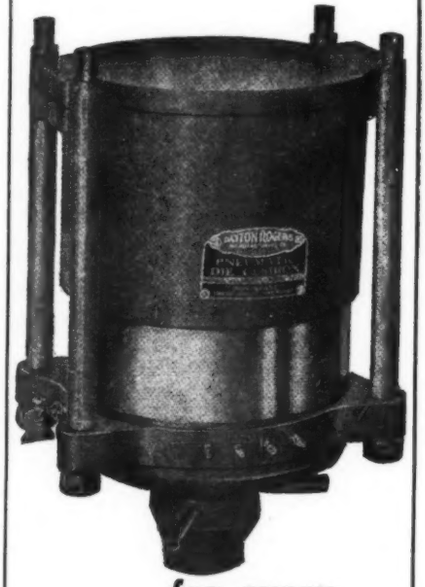

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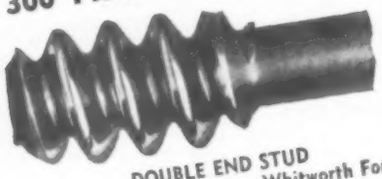

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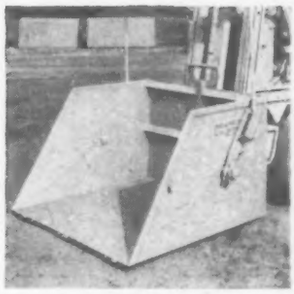

Above skip type body. Below drop bottom body. Note how bottom forms chute for material.

Remarkably versatile and mobile, the new Dempster-Dumpster "DID" provides an efficient and economical intra-plant materials handling system applicable to nearly every industrial operation. With one hoisting unit handling many bodies, this system is ideal for shifting material from point to point in plant and yard operations. On each trip, up to 2500 pounds of material can be picked up and carried inside the plant from yard stockpiles. Ashes or waste can be carried outside, dumped into a bin or truck body not exceeding 94 inches in height.

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Shown above is the Dempster-Dumpster Type "DID" Tractor Hoisting Unit dumping a tilt-type body. At left top, the tilt-type body is in carrying position, and below Hoisting Unit approaches body to make the pick-up which is accomplished without the driver leaving his seat.

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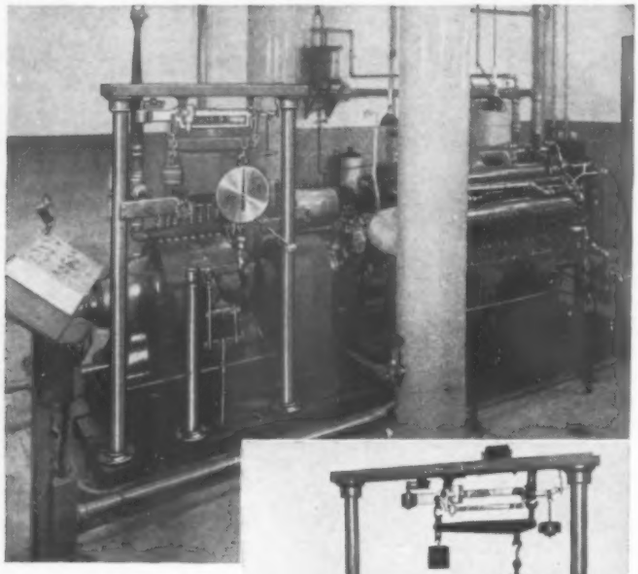

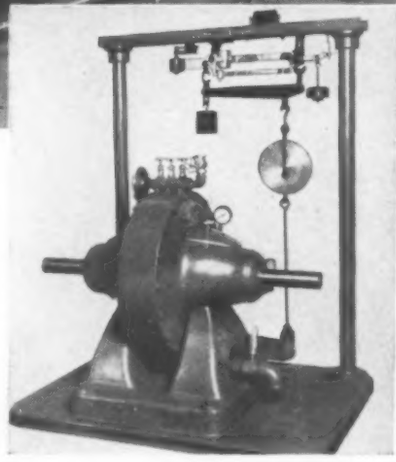

Installation of a Taylor Hi-Eff Dynamometer for testing 2000 HP marine engines at Packard Motor Company — Marine Engine School.

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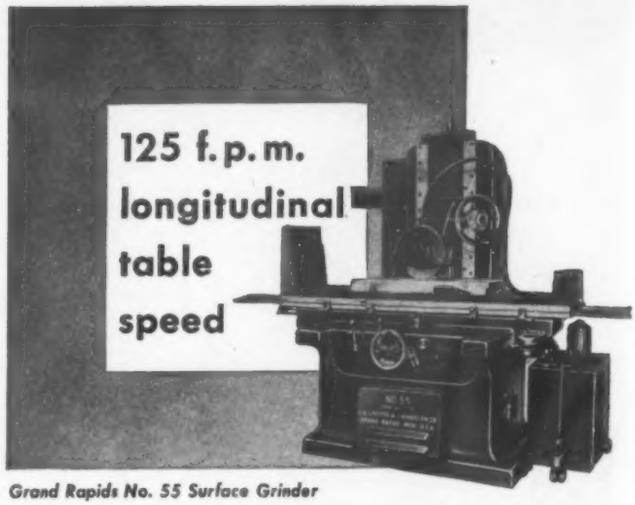

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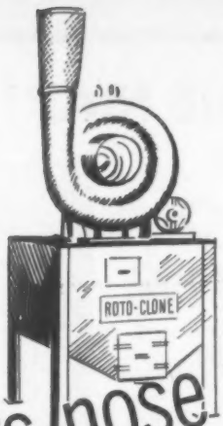

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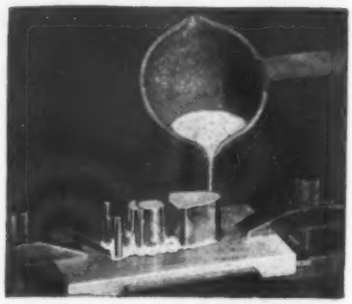

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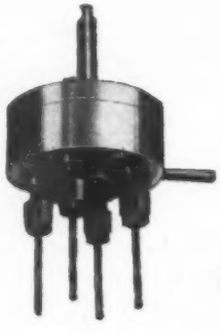

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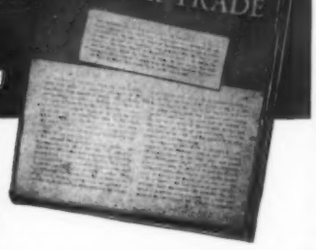

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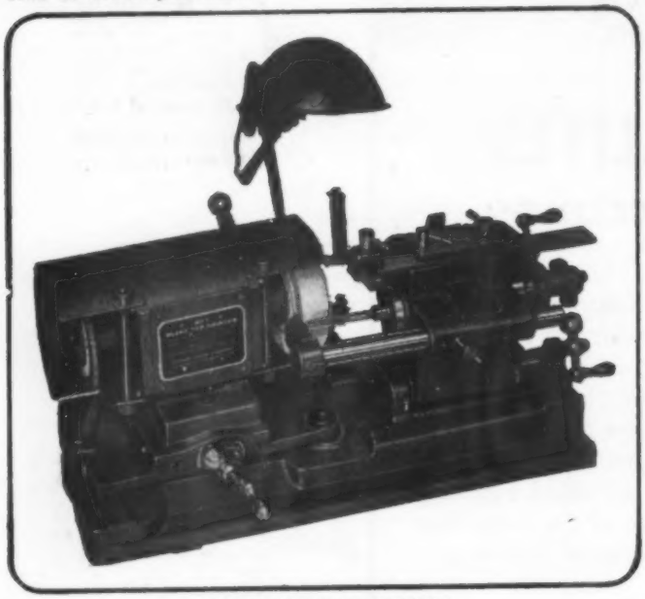

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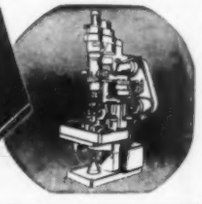

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MERZ Universal Checking Plates and Fixtures are cast from special, fine-grained gray-iron alloys —are extremely rigid and unconditionally guaranteed against warpage. Available in a wide range of sizes to meet every requirement.

MERZ builds a complete line of precision inspection equipment, including AGD standard plugs and gages and well-known *New-Matic* Measuring Machines, Taper Gages and Automatic Sorting Machines. Write for complete information, including illustrated technical data.

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MERZ

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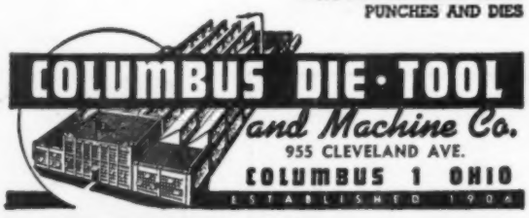

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ESTABLISHED 1904

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CENTERLESS FEED POLISHING MACHINE

No special skill required to produce fine work

This high speed automatic machine for polishing and buffing cylindrical work will give any grade finish at fastest feeds and lowest costs.

Wheel mounting is unusually heavy, the shaft running in heavy self-aligning ball bearings and driven by a triple V-belt. Quick adjustment is provided for wheels and a trueing device for trueing wheels while in motion. A centerless feed mounted in tilting housing provides for varying speed feeds. All parts are easily accessible.

Write for illustrated bulletin giving full details.

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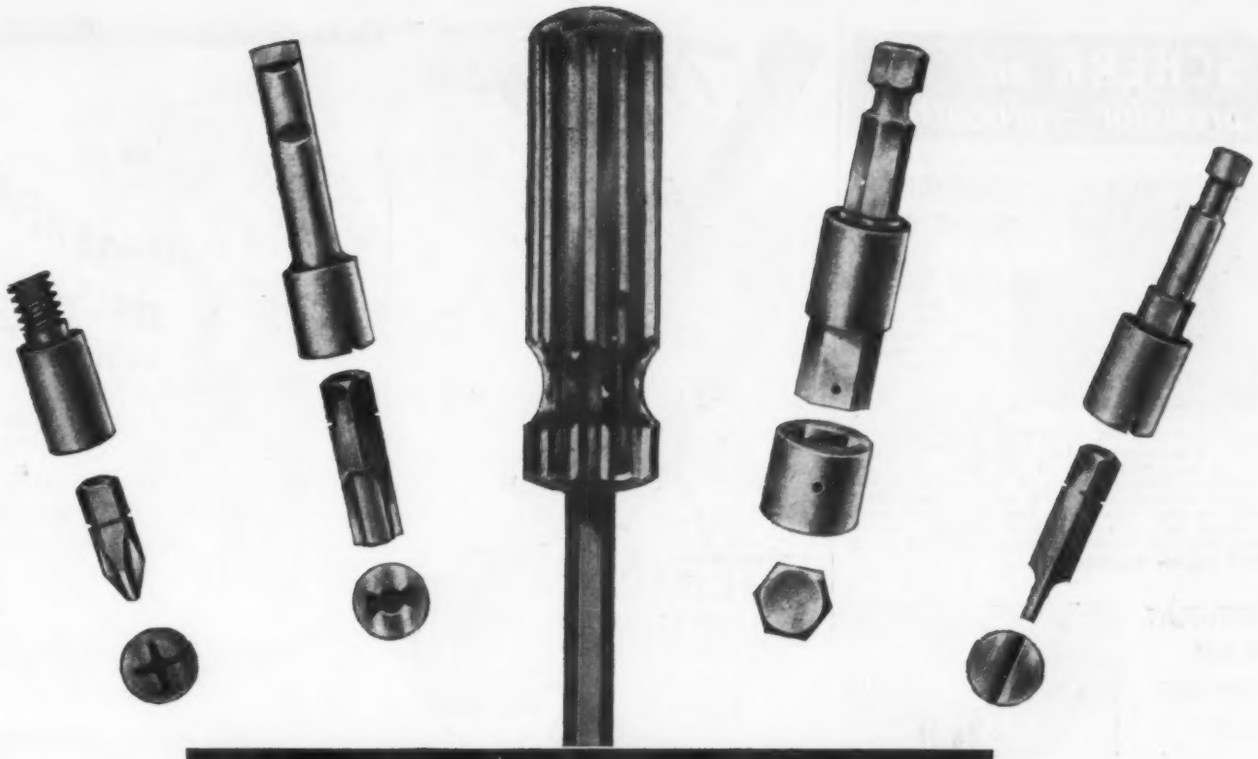

Apex Bit Holders do a BIG JOB for LESS

APEX has the *right* bit holder for driving Phillips, Frearson, Slotted, Clutch Head, Socket or Hex Head Screws.

These bit holders do a big job with a minimum inventory. You merely get the bit holders you need (they last indefinitely), then order tips (of whatever types you need), discard the worn out tips and insert new ones.

Holders accommodate the short, money-saving bits in a full range of sizes. Holders are furnished for practically all makes of power and spiral drivers.

On hex head screws each replaceable, long-wearing socket has *two lives*. Use one end until it is worn, then turn end for end—and you have a new socket.

Write for Catalog No. 20, which gives complete details.

APEX

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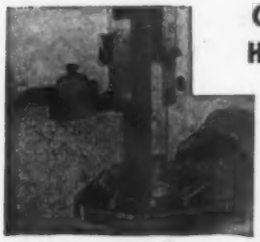
SCHERR *aids to precision – production*

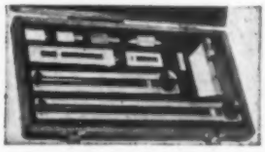


CHESTERMAN HEIGHT GAGE

A big, sturdy stabilized instrument which can double the output of your skilled toolmakers. Fine adjustment by screw operated from knurled nut on base (see photo) eliminates all chance of rocking or shifting instrument while measuring. Finger pressure on two lugs frees split nut for rapid up or down adjustment of the head. 2½" long vernier in place of the normal ⅜" vernier provides greater visibility without the need of magnifier or removing gage from work. Both English and metric readings one on each face of column. Made in sizes from 12" to 48"—capacities sufficient for the most unusual measurements.

OPTI-FLAT GLASS SURFACE PLATE

Here is the basis for vertical measuring accuracy—an optically ground glass surface, flat within 50 millionths over the total area. A solid, non-warping, thick disc of Pyrex brand glass, set in a heavy wood base with dust-proof cover. Immune to the internal strains which may affect the accuracy of metal surface plates, with the added advantage that accidental scratches cannot cause raised burrs, nor long usage wear the hard surface. For real accuracy in layout work and critical inspection, start from the perfect surface of a Scherr Opti-Flat. Two sizes—12" diam., 2" thick, $58 and 16" diam., 3" thick, $88. Also a complete stock of hand-scraped metal surface plates, angle irons, measuring irons, etc.



GAGE BLOCK UTILITY SET

Quick adjustable type holders. Greatly expands the usefulness of any set of standard gage blocks. The complete set includes four holders—2", 4", 8" and 12", two jaws each for inside and outside measurements, a 60 deg. center point, a scriber point, and a substantial height gage base. Holders have no long projecting screws to make handling awkward. Every shop can profitably use one or more of these economically-priced sets, which will save their cost many times over by applying gage block accuracy at first hand, allowing for no variation through the use of any other tool. Any parts of this set can be furnished separately at moderate cost. Set, $98.50.

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Write for full details on these tools, and for the Scherr Small Tool Catalog.

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INTERNAL GROOVING TOOL

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F—13A

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American Machinist

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It took 3 men to move a loaded kiln car (3 tons) out of kiln after 3-day cycle at 450° F. Heavy oil carbonized, freezing the wheels. First remedy—powdered graphite in kerosene—helped, but these relatively large graphite particles settled in the carrier fluid. The cure was "dag" colloidal graphite dispersed in kerosene. Excellent suspension and resulting graphoid surface on friction parts reduced wheel maintenance 25% and manpower from 3 to 1.

Acheson Colloids engineers will be glad to prescribe for your special lubricating problems

Kiln car photograph courtesy Ceramic Industry

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- high temperature bearing lubrication ☐
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- drawing aluminum wire ☐
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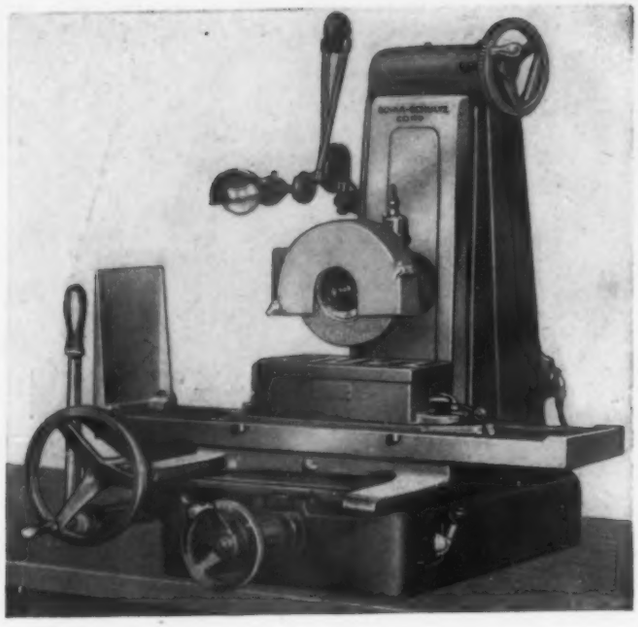
ACHESON COLLOIDS CORPORATION

PORT HURON, MICHIGAN



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With BOYAR-SCHULTZ No. 6-12 BENCH MODEL SURFACE GRINDER

(1) *Saving in Time.* This saving alone will justify one or more No. 6-12 Bench Model Grinders installed on tool makers' benches or in convenient places in the tool room, instantly available for close tolerance grinding of the many important small jobs encountered in every shop.

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Many superior features make this Boyar-Schultz Surface Grinder an outstanding performer in producing the fine finish and extreme accuracy necessary in fine gage, grinding, tool and die work as well as in some production grinding.

Its sturdy ruggedness maintains that fine accuracy for a long period of time . . . much longer than similar machines are expected to last.

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BOYAR-SCHULTZ CORPORATION

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How to lick everyday machine shop problems *quickly—easily*

HUNDREDS of time-and-money-saving pointers in this practical shop manual

help insure *increased efficiency and profit in every shop operation.* Long the "bible" for thousands of machine-shop owners and managers, this manual shows you how to operate your shop according to the time-tested, experience-proven methods that reap biggest profits. It covers everything from shop layout to inspection methods — how to equip the shop, how to route and handle work, how to estimate, how to train workers, etc.—with many workable methods and suggestions taken from the practice of leading shops of all types and sizes. You can adapt the best methods of shop operation to your own setup, no matter what its size.

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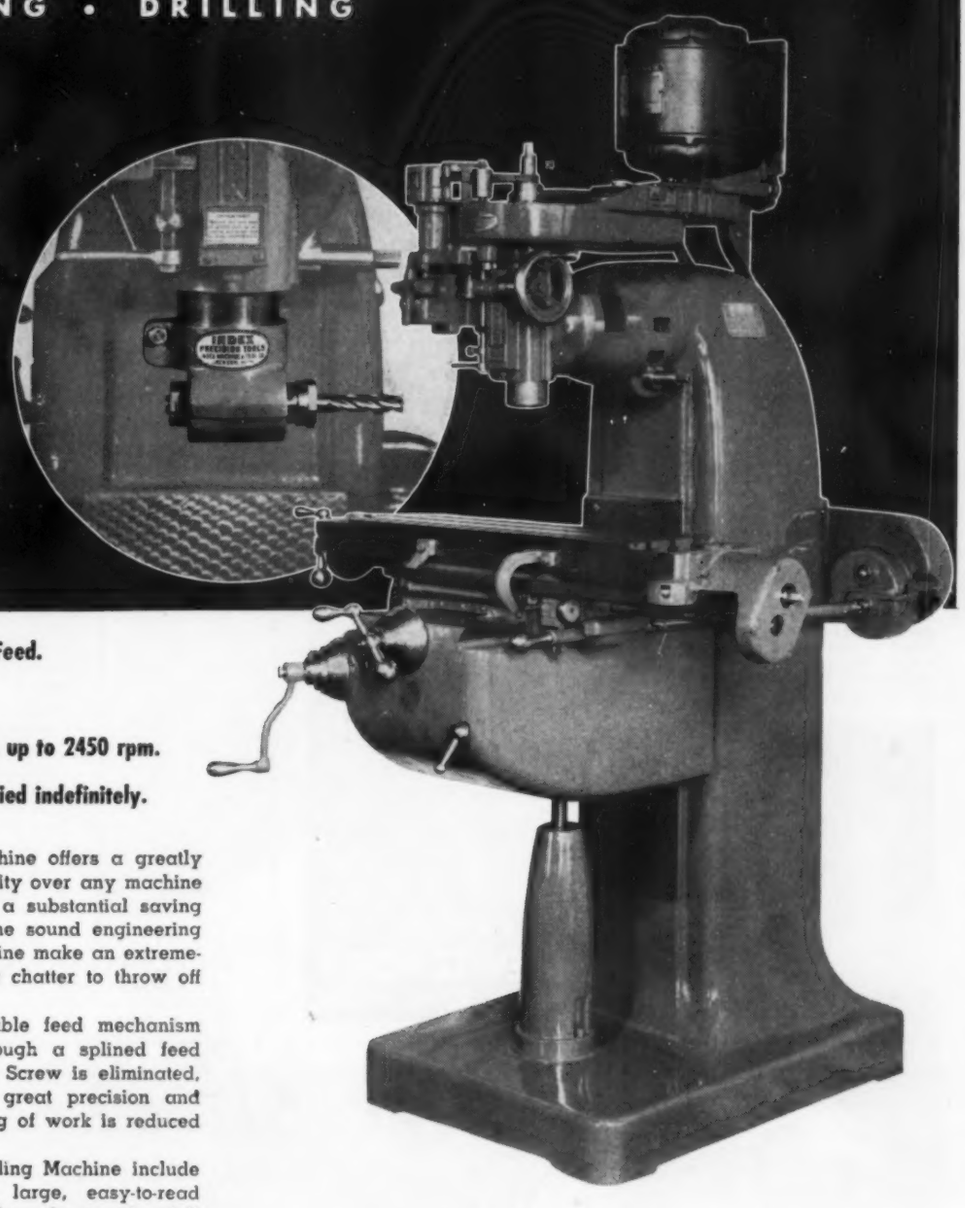

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- **Three table speeds can be varied indefinitely.**

The Model 50 Index Milling Machine offers a greatly increased range of working capacity over any machine of comparable size or cost, plus a substantial saving on production time and labor. The sound engineering and solid construction of the machine make an extremely rigid unit without deflection or chatter to throw off the accuracy of the work.

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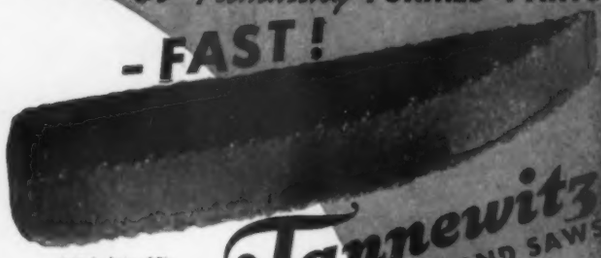

Actual photo of file friction sawn on Tannewitz High Speed Band Saw

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Cost reductions that are downright amazing are effected in the cutting of an extremely wide variety of materials by friction sawing with TANNEWITZ HIGH SPEED BAND SAWS: flat sheets, hardened or soft steels, armor plate plastics, and many others. Formed aluminum parts can be trimmed without using a rest of any kind. Whatever your cutting problem, chances are it can be done faster and better with TANNEWITZ HIGH SPEED BAND SAWS. Write for booklet. "FRICTION SAWING."

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It costs money to operate big lathes—ties up costly equipment, takes more expensive tooling, more power, more floor space, requires a more experienced operator. It's just good business to have smaller, handier, faster, lathes like the SHELDON T-S56 for much of your work, and save the difference in operating cost.

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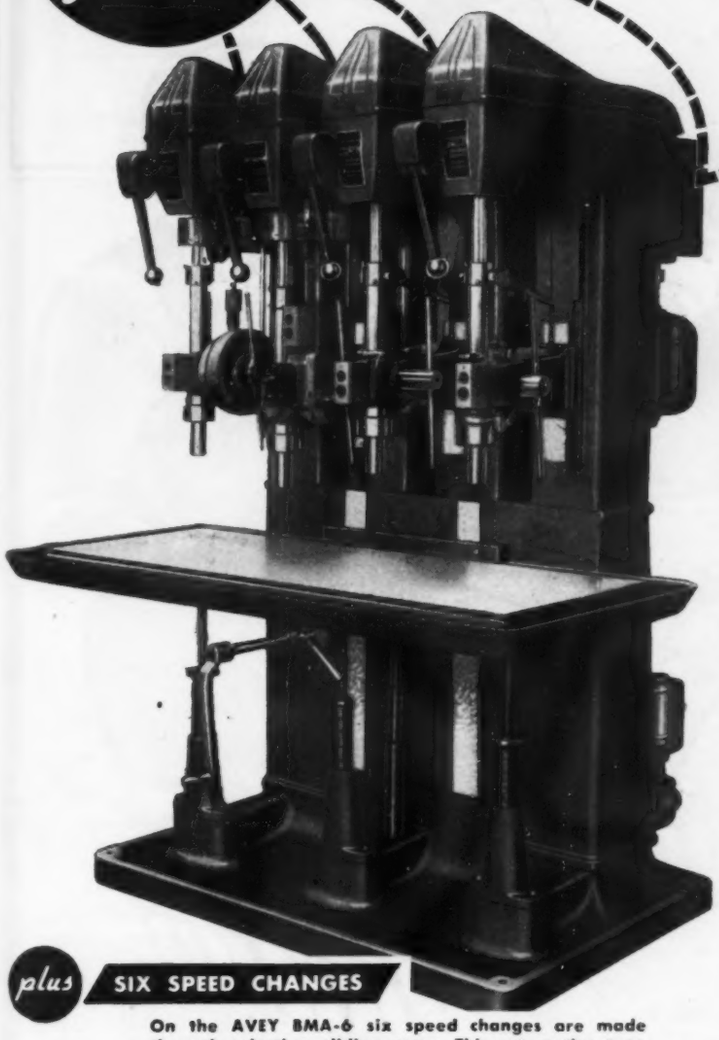

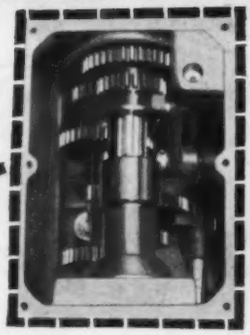

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F-14

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EXECUTIVE ENGINEER desires connection with medium size company to assume full responsibility as production manager, plant superintendent or chief engineer. 25 years of unique practical, design and manufacturing experience. Specialist in manufacturing of automatic machinery, instruments, tools, fixtures, precision gears. Thoroughly familiar with engineering and developing new products, purchasing, assembly, inspection, cost control, budget planning, plant engineering, labor relations, contract negotiations. Capable organizer with excellent record to get things done. Age 45. College Graduate M.E. Only permanent position considered. PW-3686, American Machinist.

CHIEF ENGINEER or Assistant position. Twenty years diversified experience on industrial and consumer items. Designing, development, laboratory and project engineering. Electric appliances, motor driven tools, pneumatic equipment and intricate electro-mechanical devices. Wide experience in originating and developing patentable items, modernizing existing lines and designing for practical production. Also have handled tool designing and production problems. Executive ability, college graduate, age 44. Write PW-3945, American Machinist.

MECHCANICAL ENGINEER. Machine Designer with 25 years record designing intricate mechanical-electrical devices, special automatic machinery; tools and machine tools, seeks full-or-part time design or consulting projects. T. Mueller, 45 W. Mohawk St., Buffalo 2, N. Y.

SUPERINTENDENT, GENERAL Foreman. Twenty years experience in direct supervision of processing and manufacturing precision machine tools. Unusual ability in handling men. Location optional. PW-4258, American Machinist.

PATENT ATTORNEY

Patent Practice
before U.S. Patent Office. Validity and infringement investigations and opinions. Booklet and form "Evidence of Conception" forwarded upon request. Lancaster, Allwine & Rommel, Registered Patent Attorneys. Suite 453, 815-15th Street, N. W., Washington 5, D. C.

$1,000,000 TOOL & DIE SHOP AT AUCTION

MACHINERY AND EQUIPMENT FORMERLY PROPERTY OF THE **AVCO TOOL & MACHINE DIVISION**

ON THE PREMISES: 1333 Alexis Road, Toledo, Ohio

Extremely Modern Machine Tools Purchased New — from 1942 to 1947

SALE DATE: Thurs., April 8th, 1948, STARTING AT 10:30 A.M.

INSPECTION APRIL 1st TO SALE DATE COMPRISING:

BORING MILLS: No. 560T-6" Bar & No. 350T-5" Bar Giddings & Lewis Table Type Horizontals, P.R.T., Hi Speed Spdls: 36" Bullard, Spiral Drive, Vertical.

PLANERS: 72" x 72" x 20' Cincinnati Hypro Openside 3 heads, and 60" x 48" x 16' Cincinnati Hypro double housing, 4 heads.

KELLER & JIG MILLS: Pratt & Whitney B.G. 2 Keller Tracer Controlled Milling & Die Sinker, size 10' x 5' (new 1947)—2 No. 3B De Vlieg Jig Mills.

LATHES & TURRETS: 16" x 54" & 2-18" x 54" American Pacemakers, 25" x 22" Axelson, 14" x 5' LeBlond Regal, 4A Warner & Swasey Universal, 12" hole, No. 5 Warner & Swasey Universal Turrets.

MILLERS: Model E.R. Cincinnati 28-120 and 28-60 Hydro-Tels, with Hydraulic depth controls, 2-2K Milwaukee, 4K Milwaukee, No. 3 Cincinnati Plain Millers, No. 36 Van Norman & No. 4H Milwaukee Universals, No. 2 Cinn. & 3K Milwaukee Verticals—all P.R.T.

SHAPERS: 16" & 24" G & E Industrial Universal, 24" & 32" G and E Industrial, 36" Cincinnati Heavy Duty, 8" Morey Vertical—all P.R.T.

RADIALS & UPRIGHT DRILLS: 2-5' Cincinnati Bickford Super Service 13" Col.; 4' Amer. Hole Wizard, 11" Col.; 3 No. 2 & No. 3 Avey, 2-24" Cincinnati Super Service, 24" Fosdick Hi Speed single Spld. Drill Presses. No. 314A Baker Heavy Duty.

GRINDERS: 24" x 28" x 144" & 2-8" x 12" x 24" Thompson Surface 6" x 18" & 10" x 24" Norton Surface, No. 3B Abrasive, 2-No. 22 & 25A Heald Rotaries, No. 18 Blanchard, 36" Chuck, 72A & 2-75A Heald Internals, 6" x 18" Norton Plain, 14" x 36" Norton & 14" x 48" Cincinnati Universal Cyl. Grinders, No. 13 B&S Universal, No. 2 Cincinnati, Hammond, Cowel & Sellers Tool & Cutter Grinders, etc.

POWER PRESSES: 250 Ton Danley Double Crank, Str. Side Press, Bed Area 48" x 84", No. 268¼ Toledo Double action, Toggle Drawing, Bed Area 60" x 96", 450 Ton Cap., Toledo Twin Screw Die Tryout Press, Bed Area 60" x 118". No. 5 Federal Inclinable, Geared.

ALSO 14" & 16" Do-All Saws, Cochrane & Bly Hyd. Cold Cutoff, Marvel Saws, 6' Chicago All Steel Power Shear, Profile Grainder, Die Filers, Sanders, Woodworking Cutoff and Swing Saw, Portable Welders up to 300 amps. 6000# Clark Forklift truck, Arbor Presses, Heat treating & electric Furnaces. Large ass't. of inspection tools, small tools, factory equipment, electric & chain hoists, Fine ass't. of steel office furniture, office machinery & Hundreds of Items Too Numerous to Mention.

IMPORTANT! DETAILED DESCRIPTIVE CIRCULAR FREE ON REQUEST — WRITE — WIRE — PHONE TO:

INDUSTRIAL PLANTS CORPORATION

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NEW — H.S. STEEL • FIRST QUALITY

INVOLUTE 1P to 48P } *ALL LISTED*
BEVEL 3P to 24P } *PITCHES*

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DeWITT TOOL CO. 173 Grand St., N. Y. 13, N. Y.

WILL TRADE
HYD. HONING MACHINE
FOR 6 SPINDLE CONOMATIC

A #2 Barnesdril Hydraulic Honing Machine with 8 ft. spindle travel made in 1942 for a late Model 1¼" six spindle Conomatic or equivalent automatic.

KENDO MACHINE CO.
P.O. BOX 70 SUNBURY, PA.

FOR SALE

1—6B Used Special Nazel Forging Hammer. Complete with electrical equipment.

1—6N Used Special Nazel Forging Hammer. Complete with electrical equipment.

Excellent Condition

CLEVELAND FORGED PRODUCTS, INC.
18910 SOUTH WOODLAND AVE.
CLEVELAND, OHIO

WANTED
CAM MILLING MACHINE

We want to purchase used Rowbottom Cam milling machine in good condition. *Write or wire:*

Hartford Special Machinery Co.
HARTFORD 5, CONN.

TOOL RECLAIMING

All types of tool and cutter grinding—FORM TOOLS, END MILLS, CARBIDE TOOLS — INTERNAL and EXTERNAL GRINDING, PROMPT DELIVERY. UNLIMITED capacity for large or small jobs. More than 40 years experience in the industry.

WOODWORKERS TOOL WORKS
222 So. Jefferson St., Chicago 6, Ill.

PUNCH PRESSES WANTED

Toledo—Bliss #1 Deep Gap Single Geared
Ferracute—#C92 External Notching

BROWNING MFG. COMPANY, INC.
Maysville, Kentucky

WILL TRADE GRINDER

We have a P & W Contour Cutter Grinder, M1311, Serial #254, which has had less than 100 hours use. Excello Spindle, 220/440/60 AC, motor and 50 wheels. Complete except Diamond. Cost $3975.00 F.O.B. W. Hartford in 1944.
Want #2 B&S Surface Grinder Motorized; 3Z Gorton; Rhodes Shaper, or small B&S or K&T Horizontal Mill, or what have you?
O. E. McLAUGHLIN, VERMONTVILLE, MICH.
PHONES 3371, 3381, 3811

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MAIN 6347-6348

FALK
MACHINERY COMPANY

18 WARD ST.
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Every Item Guaranteed as Represented

Norton Late Type 6x18 Hydraulic Cylindrical Grinder, Type "C" with complete motor drive & built-in push button controls wired for 3/60/220/440 volts service. Motor driven coolant system.

ENGINE LATHES

32"x28' Bridgeford, Geared Head
32"x16' Bridgeford, Geared Head
28"x10' Davis, Quick Change Gear
26"x18' Bridgeford Geared Head
24"x36' New Haven, Motor Drive
24"x22' Lodge & Shipley, Geared Head
24"x18' American Q.C.G. Grd. Hd. 11' centers, Taper Attach. Motor Dr.
24"x12' Putnam, Quick Change Gear
24"x10' LeBlond, Quick Change Gear
20"x11' Schumacher-Boye, Q.C.G.
20"x10' American, Q.C.G.
20"x10' Hendey, Q.C.G motor dr.
20"x8' Lodge & Shipley, Q.C.G. M. Dr.
18"x10' American Geared Head
18"x10' Davis, Q.C.G. M. Dr.
18"x8' Lodge & Shipley geared head
18"x8' Hendey Q.C.G. 49" centers
18"x7' Lehman, Q.C.G. M. Dr.
18"x6' American, Geared Head, MD.
16"x8' Hendey, Q.C.G. M. Drive
16"x6' Lodge & Shipley Geared Head
14"x8' Rockford, Q.C.G. Collets
14"x8' Pratt & Whitney, Q.C.G. Collets
14"x6' LeBlond, Q.C.G. M. Drive
14"x6' Mulliner-Endlund, M. Drive
14"x6' Hendey, Q.C.G. M. Drive
14"x6' Rockford, Q.C.G. M. Drive
13"x5' South Bend Q.C.G. 30" centers
12"x30" American, Wood Spinning
12"x5' Sidney, Geared Head
12"x5' Hendey, Q.C.G. M. Drive
12"x5' Sebastian Q.C.G. Grd. Hd. 30" Centers, Taper Attach. Motor Dr.
12"x3' Craftsman, Bench, M. Drive
11"x4' Sidney, Q.C.G. Floor Type
11"x4' South Bend Q.C.G. 20" centers
11"x3' South Bend, Q.C.G. M. Drive
10"x24" Logan, Q.C.G. (new) in stock
9"x12" Sundstrand Mfg. Type
8"x18" Rivett Precision, Bench
9"x15" Porter-Cable, Production

TURRET LATHES

Morey #2 Geared Head, 1" Cap.
Simmons, Microspeed, 1" Cap.
W-Swasey, Univ. #4, 1½" Cap.
Gisholt #4, Univ. 2" Cap.
W-Swasey #2A, Univ. 2½" Cap.
Gisholt #5, Univ. 2½" Cap.
W-Swasey #3A, Univ. 3½" Cap.
Bullard 42" Vert. Turret
Jones & Lamson #3 Univ. Bar Feed

Heald #49 Single End, Two Head Borematic. Arranged direct current motor drive. Series 200 Spindle Heads. Universal Fixture on hand feed cross slide. Complete coolant system.

POWER PRESSES

Clearing 200 Tons, S.S. 10" Stroke
Michigan O.B.I. 36 Tons Cap.—2" Stroke
General 8 Tons, Flexible Power Press, M. Dr., Arranged for motor dr.
Ferracute #EG52 Geared Coining Press, 150 Tons Cap.—Up Moving Ram
Baxendale O.B.I. 11 Tons, 1½" Stroke
Zeh & Hahneman, Single Action Cam Press, Spring Return Type—35 Tons Capacity, Arranged for motor dr.

DRILLING MACHINES

Natco #12, 20 Spdles. 3/16" Cap.
Natco #D6, 24 Spdles. 5/16" Cap.
Natco #D5, 14 Spdles. 5/16" Cap.
Fox #15, 54 Spdles. #1 m.t.
Minster #2D, Sgle. Spdle. Upright, compound table, #5 m.t., heavy duty
Cinci.-Bickford, 3½' arm, 9" col. Radial
Cinci-Bickford, 4' arm, 11" col. Radial
Cinci-Bickford, 5' arm, 13" col. Radial
Fosdick, 5' arm, 14" col. Radial
Cinci-Bickford, 6' arm, 15" col. Radial

SHAPERS & PLANERS

Pratt-Whitney Vert. Shaper, 6", M. Dr.
Logan 7" Horiz. Shaper, Motor Drive
Machinery Sales 16" Crank Shaper
Gould & Eberhardt 16" Crank Shaper
Gould & Eberhardt 24" Crank Shaper
American 24" Crank Shaper, Motor Dr.
New Haven 12" Vertical Shaper
Whitcombe, 24x24x6 Planer
Niles-B-P, Shaper Planer, 20x20x24
Ingersoll Planer Type Mill 30x30x16
Betts, 120"x72"x35' Planer
Ingersoll Planer Type Mill, 30x30x12

AUTOMATICS

#0 & #00 Brown & Sharpe Full Automatic, Standard Speed

1—1¼" Cone 4-spindle Automatic, Motor Driven, Threading Spindle

1—#515 National Acme 9/16" 4-spindle Automatics.

1—#2 Brown & Sharpe Auto.

LATHES

14"x8' Hendey
15"x5' Sebastian
18"x8' American
20"x10' Lodge & Shipley
22"x48" centers Monarch (1942)
36"x30' Lodge & Shipley
36'—48"x16' Lehman Hydrotrol (1945)
50"x17' centers LeBlond (1942)

8"x15" Sundstrand, Model D (1943)
10"x22" Sundstrand, Model AA (1943)
12"x18" Lipe Carbo
16"x33" Fay Automatic (1942)
20"x25" Fay Automatics (1942)

MILLING MACHINES

No. 2H Milwaukee Vert. (1942)
No. 2 Cincinnati Vert. (1942)
No. 2M Cincinnati Vert. (1941)
No. 3 Standard Milwaukee Vert.
No. 3 Cincinnati Vert. High Power
24" Cincinnati Production
No. 1-18 Cinn. Mfg. (1940)
No. 2-18 Cinn. Rise & Fall (1941)
No. 2-24 Cinn. Rise & Fall (1944)
18-48 Milwaukee Simplex
No. 2—18" Sundstrand Electromil (1942)
No. 4-48 Cinn. Hyd. Tracer (1942)
No. 45-48 Cinn. Hyd. Duplex Tracer (1943)
No. 45-48 Cinn. Hyd. Plain Tracer (1942)
No. 56-90 Cinn. Hyd. (1943)
No. 2 Hanson-Whitney Thread
4"x9" Hanson-Whitney Univ. Thrd. Miller
4½"x12" Pratt & Whitney, Model C
6"x20" Pratt & Whitney, Model C
6"x36" Lees-Bradner—Model HT (1943)
4" Taylor & Fenn Spline, M.D.
Ingersoll Traveling Column Miller
24"x24"x12' Ingersoll Adj. Rail
72"x48"x12' Ingersoll Adjustable Rail

ReMANUFACTURED -(ORIGINATED BY US)- MACHINE TOOLS

Reg. U. S. Patent Office

DRILLS

No. 121 Baker
No. D-8 Colburn No. 6 M. T.
No. 3MS—24"—1 Spdl. L.G.
No. 2LMS—20"—2 Spdl. L.G.
No. 2LMS—26"—2 Spdl. L.G. (1945)
No. 2LMS—26"—4 Spdl. L.G.
24"—4 Spdl. Demco
No. 3B—24"—6 Spdl Edlund (1942)
No. 2—8 Spdl. Leland-Gifford
7'-15" Col. American Full Universal
7'-15" Col. Carlton, Motor on Arm

VERT. BOR. MILLS

34" King
42" Bullard New Era
52" King
72" Cincinnati
72" Niles Extra Heavy
84" Betts

HOR. BOR. MILLS

No. 3A Universal, 3" Bar
Rockford, 3½" bar
No. 32 Giddings & Lewis, 3½" bar
No. 360-F Giddings & Lewis (1942)
No. 560-F Giddings & Lewis (1942)

JIG BORERS

Model B Kearney & Trecker Autometric (1943)

GEAR MACHINES

No. 7125-A Fellows Gear Shaper (1942)
11" Gleason Bevel Gear Cutter
72" Cincinnati
No. 5 Newark, 80" cap.

MISCELLANEOUS

Model H-7 Micromatic Vert. Honer
No. 22-C Racine Shear Cut Hack Saw
No. 20 Bliss O.B.I. press

TURRET LATHES

No. 2 B. & S. Screw Machine, Wire Feed
No. 601 Oster Rapiduction (1942)
No. 4 Gisholt (1942)
No. 5 Warner & Swaseys (1942)
No. 5 Bardons & Olivers (1942)
No. 5 Foster, A.C. & Bar Feed (1942)
No. 2-A Warner & Swasey
No. 6R Denver, A.C. & Bar feed
No. 21-B Bardons & Oliver (1945)
No. 1-H Libby, 6¼ Hole in Spindle (1937)
18" Libby, 3½" hole in spindle
No. 4A Warner & Swasey, 7½" Hole in Spdl.

GRINDERS

4"x12" Landis, Model H (1942)
6"x18" Norton Type C Plain (1943)
6"x30" Norton Type C Plain (1943)
10"x18" Cincinnati, Model ER
10"x36" Norton Type C Plain (1943)
10"x48" Norton Type C Plain (1943)
Norton Motor Driven Plain Grinders
6"x18" ——— to ——— 24"x240"
10"x24" Landis Type C Universal
12"x36" Landis Type LCH Universal (1945)
No. 5—6"x24" Covel Hyd. (1941)
No. 34 Abrasive Surface (1943)
No. 22—12" Heald Rotary Surface
No. 25A—24" Heald Rotary Surface (1943)
72A-3 Heald Internal Grinder
72A-5 Heald Internal Grinder
10"x72" Colonial Broach Grinder
No. 5—18" Besly Disc Gdr.

HILL-CLARKE MACHINERY CO.

651 WASHINGTON BLVD. CHICAGO 6, ILL.

LATE MODELS OF MACHINE TOOLS FOR EARLY DELIVERY

BORING MILLS

30", 42" & 84" BULLARD Vert. M.D. Spiral Drive
No. 360-F GIDDINGS & LEWIS Floor Type, M.D.
No. 560-F GIDDINGS & LEWIS Floor Type, M.D.
#44 UNIVERSAL Tri-Way, Table Type

GRINDERS

#2 REID SURFACE, M.D.
12"x60" THOMPSON Type "C" Hyd. Surface
A3—16" ARTER Rotary Surface Grinder
#10 B&S, T&C, M.D.
No. 72A3 HEALD Plain & Sizematic, M.D.
No. 4T SELLERS Tool Grinder, M.D.
9" P&W Hyd. Gear, M.D.
No. 11 Blanchard Rotary, 16" chuck
4—No. 4H LANDIS 4"x18" Plain Grinders with hyd. straight infeed, hyd. timer and hyd. footstock.
6"x18" NORTON & LANDIS Type C Plain
6"x30" NORTON Type C Plain Cyli.
14"x36" LANDIS Type C Plain
24"x96" NORTON Plain, M.D.

LATHES

AMES Precision Bench Lathe, 1" collet cap., M.D.
#820 LOGAN Lathe, M.D.
14"x30" c.c. MONARCH Model C Toolroom, M.D.
14"x30" c.c. LEBLOND Heavy Duty, M.D.
15"x6' bed CARROLL & JAMEISON Geared Head, M.D.
16"x54" c.c. LEBLOND Heavy Duty, M.D.
16"x30" c.c. MONARCH MODEL "C" Toolroom, M.D.
16"x30" MONARCH MODEL "W" Engine, M.D. with KELLER CONTROLS
50"x17" centers LEBLOND "BIG SWING" Lathe, M.D.

MILLING MACHINES

No. 5/60 CINCINNATI Duplex Hydro., tracer control mechanism for auto. rise and fall of spindle carriers.
No. 00 CINCINNATI Hor. & Vert.
No. 2-24 CINCINNATI Auto.
No. 12-24 K&T Simplex, M.D.
No. 2G KEMPSMITH All Geared Univ. M.D.
No. 12 VAN NORMAN Universal Miller, M.D.
No. 2H K&T Vertical, Power Feed, M.D. (3)
No. 2MS CINCINNATI Dial Type, Plain, M.D.
No. M-950A TAYLOR & FENN Vert. M.D.
No. 12B P&W 2-spindle PROFILER

TURRET LATHES

No. 0 B&S Wire Feed Screw Machine, M.D.
No. 2G MOREY Ram Type, M.D.
Nos. 3 & 4 GISHOLT Ram Type, Univ., M.D.
Nos. 2, 3, 4, & 5 W&S Ram Type Univ., M.D.
No. 3 J&L Ram Type Univ., M.D.
No 4A W&S Saddle Type Univ., M.D.

DRILLS

No. 262 BARNES Heavy Duty Drill
6-spdle ALLEN 5 powerfeed spindles, belted M.D.
3'9" CINCINNATI BICKFORD "Super Service" Radial

MISCELLANEOUS

40"x32"x51" OHIO Tilting & Revolving Rotary Table
V-16 DOALL Contour Saw, M.D.

WIGGLESWORTH MACHINERY CO.

203 BENT STREET Kirkland 7-5242 CAMBRIDGE, MASS.

UNUSUAL VALUES

Milling Machines—#1, Universal, #1 American (new) plain, #1 Vertical.

Drills—Large selection, single and multiple spindles also bench types, many of them new.

Gear Cutters—Brown & Sharpe #3—26", Gould & Eberhardt 42".

Grinders—Cylinder B & S #11, Planer type 16"x36", Surface 13"x62", also new (small) Universal bench and floor type. All with coolant, motorized.

Lathes—14"x6' 8', 10'—16"x6', 8', 10'—18"x6', 8' 10'—26"x16'—all cone drive, several motorized also (new) 18"x8' and 10' geared head, motorized.

Large stock 19" and 12" bench and floor type.

Planers—Single head 24"x6', 24"x8', 26"x8'.

Shapers—16", 20", 24", B.G. crank.

Turret Lathes—J & L 2"x24"—3"x36" also Acme, W & S Turret (vertical) boring and facing mills, 5 hole turrets, 30", 36", 40".

SPECIAL—New totally enclosed, dust proof, fan cooled, ball bearing saw arbor motors, plain shafts to size or threaded, and with collars, measures only 3¼" from center of shaft to flatted top (1 h.p. to 15 h.p.) 2 or 3 phase, 3600 r.p.m.

WOOD WORKING MACHINERY—A very large stock of new and re-built, practically all motorized. New Motorized overhead cut-off and miter saw for wood, plastics, steel, aluminum and other metals. The above list is only a fraction of our stock which changes almost daily, therefore, tell us definitely what you want since we are adding considerable number of machines to our stock which are too many to list. What we have today may be sold tomorrow, so a list is really not dependable.

Drill—Foote-Burt #25—24" Hi Duty 3" capacity in steel, motor attached.

PATTERN MAKING MACHINERY—42"x16' bed wood lathe, compound rest, rack and pinion feed to carriage; 16" heavy duty jointer, extra long bed, front table tilts for giving draft to pattern work; tilting able also tilting arbor rip and cut-off saws; band saws; jointer; floor and bench type trimmers; and also many other machines for pattern work.

THE OSBORNE & SEXTON MACHINERY CO.
P. O. BOX 88, COLUMBUS 16, OHIO

No. 1 Bakewell Tappers
No. 3B Abrasive Surface Grinder
No. 14 Cochrane & Bly Vertical Mill

MONA

D. E. DONY MACHINERY CO.

47 Laurelton Road, Rochester 9, N.Y.

POWER PRESSES

BLISS, TOLEDO, V & O, ETC.
REBUILT - GUARANTEED

MONA

JOSEPH HYMAN & SONS
Tioga, Livingston and Almond Streets
Philadelphia, Pa.

LATEST TYPE NEARLY NEW MACHINES

AUTOMATIC SCREW MACHINES

BROWN & SHARPE #4, 1½" capacity, latest type
GOSS & DeLEEUW 6"x6¾" 4 spindle chucker, latest
NATIONAL ACME 9/16, 5 spindle, Model D, M.D.

BORING MILLS—Horizontal

DETRICK & HARVEY 4" bar, Floor Type, M.D.
EXCELLO #54, #2112A, #112C single end, 1 & 2 spindles, Borers, latest type
GIDDINGS & LEWIS #25, 2½" bar, M.D.
GIDDINGS & LEWIS #32, 3½" bar, M.D.
HEALD #46B, #48A, #49 single and double end Borers, latest type
LANDIS #35, 3½" bar; Floor Type
NILES BEMENT POND 4½" bar, M.D.
NILES BEMENT POND 5", 6", bar, floor type
P & H #10 3½", bar floor type, M.D.
UNIVERSAL 3" bar, high speed, latest type
UNIVERSAL No. 3A, 3" bar M.D.

BORING MILLS—Vertical

BETTS 120", 2 swivel heads, AC, M.D.
BETTS (Consolidated) 84"—3 heads, AC, latest
BULLARD 36" vertical turret, M.D., New Era
BULLARD 36" vertical turret, M.D., New Era
KING 36" Vertical Turret, M.D., Latest Type
KING 42"—2 heads; A.C., M.D., Latest Type
NILES 84", 100", 120", 2 swivel hds., M.D.

BROACHES

LaPOINTE #3 mech., M.D.
LaPOINTE #4L, Horiz. Hyd., latest type
LaPOINTE SRV-10-54, Vert. Surf. Hyd., Latest

DRILLS—Multi. Spindle

BAUSH 4 Adj. multiple spdl., M.D.
BODINE #42-20, #42-30, Latest Type
FOOTE BURT 20 spindle, latest type
KINGSBURY 4 spindle Model GC, latest type
NATCO #D5 Adj. multiple spdl., latest type
PRATT & WHITNEY #12 Adj. multiple spdl., M.D.

DRILLS—Sensitive

ALLEN #1, #2, #3, latest type
AVEY #2 #MA6, 1 & 3 spindle, latest type
BARNES #H3 Hydram, heavy duty, hydraulic, latest
BUFFALO #4, latest type
COLBURN #14 2 spindle M.D.
DELTA Single spindle bench latest type
EDLUND #1B, #2B, #2MS, 1 to 3 spindles, latest type
FOOTE BURT #2, #3, single spindle, latest type
HENRY & WRIGHT 2 spindle, M.D.
HIGH SPEED HAMMER Model R53, latest type
LELAND-GIFFORD #2LMS, 2 spdles., latest
SNYDER 25", M.D.

DRILLS—Radial

AMERICAN 5'13", plain, motor drive
CINCINNATI BICKFORD 6'15" plain or univ., M.D.
DRESSES 5'13" universal, M.D.
DRESSES 4'13" Plain M.D.
FOSDICK 5'14" M.D.
NILES 6' Universal, M.D.
WESTERN 5'18", 6'20", latest type

GEAR CUTTING EQUIPMENT

BARBER COLMAN Type S hobber, latest type
BARBER COLMAN #12 hobber, M.D.
BARBER COLMAN No. 3 hobber—latest type
BROWN & SHARPE No. 3H gear cutter, M.D.
FELLOWS #615A, #61, #645A3, #7A, #72, #64, #77 High Speed Gear Shapers; latest type
FELLOWS #12M Involute Measuring Instrument, latest
FELLOWS #6Z2 Gear Shaper; high speed; latest type
FELLOWS #13LS Lapper, latest type
GLEASON 3", 12" straight bevel generator, Latest Type
GLEASON #7 hypoid, spiral, bevel, zerol. Latest Type
GLEASON 10", 15", Spiral Bevel Generator, M.D.
GLEASON 11", 18" Straight Bevel Generator, M.D.
GLEASON #20 Spur Gear Tester, latest type
GLEASON 36" Straight Bevel Planer, M.D.
GLEASON #4, #6, #13, #18 Bevel and Hypoid Tester
GLEASON 36" str. bevel gear planer, M.D.
GOULD & EBERHARDT 12HS hobber, Latest Type
GOULD & EBERHARDT #36H Hobber, M.D.
PFAUTER #1, #2 universal hobber, M.D.
PRATT & WHITNEY 10" Grinder, hyd., latest

GRINDERS—Cyl.—Plain & Univ.

BROWN & SHARPE #1, 2, 3, 4, Universal, Latest
BROWN & SHARPE #5 Plain, 3 x 12, Latest Type
BROWN & SHARPE #20 10x18 plain, latest type
CINCINNATI 6" x 18" Plain, Model EA, Hyd., latest
LANDIS 6x18, Type C, hydraulic, latest
NORTON 10x18 Type C. M.D., Latest
NORTON 16x72 Plain Type "C", latest type

GRINDERS—Miscellaneous

BARBER COLMAN #3 Hob Sharpener; latest type
BROWN & SHARPE #13 Universal & Tool; latest type
BRYANT #3, #16-16, #16-CP-16, #24, Internal Hydraulic, latest type
CINCINNATI #2 Centerless; latest type
CINCINNATI #2 Universal Cutter & Tool; latest type
CINCINNATI #3 Centerless, M.D.
FITCHBURG 14"x25" Spline, hydraulic latest
GLEASON #12 tool sharpener Latest Type
HEALD 50, 70 Internal M.D.
HEALD 75A, 72A3, 81 Internal; latest type
JONES & LAMSON 6x15, 8x48, Automatic Thread Grinder, latest type
LANDIS 5" oscillating, external, M.D.
OLIVER #510 Drill Grinder, latest type
OLIVER univ. cutter and tool, Latest Type
THOMPSON 6"x48" Auto., round broach, M.D.

GRINDERS—Surface

BLANCHARD #16, 24" chuck, M.D.
BLANCHARD No. 16A—Dial Type—M.D.
BLANCHARD #27-18 M.D., Latest Type
BLANCHARD #11, 16"; Latest Type
G. & L. #35, 8x24 hyd., Latest Type
G. & L. #55, 12x36 hyd., latest type
HEALD #22 Rotary, 12" chuck, latest type
MATTISON 12x16x60 hydraulic, latest type
MATTISON 14x16x60 hydraulic, latest type
MATTISON 20x24x72 hydraulic, latest type
NORTON 6x18 Hydraulic; latest type
NORTON 10x36 hydraulic, latest type
PRATT & WHITNEY 8" Rotary, M.D.
THOMPSON 16x30x48 hydraulic, latest type

LATHES—Engine and Mfg.

BARNES #420, 2 spdl. deep hole drill, Latest Type
BAUSH 1⅛"x30" 2 spdl. deep hole drill and borer
BETTS-BRIDGEFORD 60"x14' centers (raised to swing 84") P.R.T.: A.C. M.D.
BRIDGEFORD 36"x28', 36"x32' bed—2 carriages
ELGIN #CB-59 precision bench, Latest Type
HARDINGE TR-59, Latest Type
HAMMOND Type L polishing lathe, Latest Type
HENDEY 12x54" centers, M.D.
JONES & LAMSON "Fay" 20x25" automatic, latest
LeBLOND #2 deep hole borer, Latest Type
LeBLOND 17x5', 20"x10' bed, RP, Timken, Latest
LEHMANN 16x30" centers, TIMKEN, latest type
LODGE & SHIPLEY 16/20x30" centers, Timken, Latest
LODGE & SHIPLEY 18x72 centers, M.D.
LODGE & SHIPLEY 36"x144" centers; geared; M.D.
LoSWING 4x60, 4x84, 8x60, 8x108, 5x34, Latest
MONARCH 12x30" centers; Timken; latest type
MONARCH 16x28" geared-head, M.D.
MONARCH 10"x20" centers, Model EE, Timken, latest
MOREY Model A 8"x120" shaft turner, Latest Type
NILES 42"x60" double head, motor drive
NILES 48x35', centers, heavy Duty, 2 carriage, Timken Bearing, PRT, Latest Type
NILES 60x10', 35', centers, 1 or 2 carriages, PRT, Latest Type
NILES 72"x62' centers, combination Boring and Turning, Motor Drive
NILES 30x50' Boring, Timken, Latest Type
NILES 48x63' centers, 48x87' centers, combination boring and tooling, M.D.
NILES 90"x110" centers Car Wheel M.D.
PRATT & WHITNEY ½Bx30", 2 spindle, Deep Hole Drill, latest
PRATT & WHITNEY 10"x20" centers Bench Type, latest type
REED PRENTICE 16x24" centers, geared head, M.D.
SPRINGFIELD 14"x6' bed, geared head, M.D.
SPRINGFIELD 16"x6' bed, geared head, M.D.
SPRINGFIELD 16"x30" centers Timken, latest type
SUNDSTRAND 8x15 Style D, Automatic, Stub, latest
WARD, HAGGAS & SMITH—18/30x66" centers gap, motor drive, Latest Type

LATHES—Turret

BARDONS & OLIVER #5, #7, TIMKEN, Latest Type
CINCINNATI ACME No. 1 Timken, Latest
GISHOLT #1L, #2L, Universal, Timken, Latest
GISHOLT #3, #4, #5 univ., TIMKEN, Latest Type
JONES & LAMSON #3, #8A Univ., Timken Bearing, latest type
LIBBY No. 1H-5 Timken Bearing—latest—5⅛" hole
MOREY No. 2G, No. 3, No. 4, Timken Bearing, latest
POTTER & JOHNSTON 5D2E, Auto., Timken, latest
WARNER & SWASEY 5, Universal, Timken Bearing
WARNER & SWASEY 3A, Univ., 6" hole, bar or chucking, Timken Bearing, Latest Type
WARNER & SWASEY #1A, Univ., Timken; latest
WARNER & SWASEY #2A Universal, Timken, latest

MILLING MACHINES—Mfg.

CINCINNATI 24", 48" duplex, TIMKEN, M.D.
CINCINNATI 3-24 Duplex Hydromatic, Timken, Latest
HALL Style D, Planetary, latest type
INGERSOLL 42"x38"x12' adj. rail, 4 heads, A.C., M.D.
INGERSOLL 32x24x16' Planer Type, 2 heads, AC, M.D.
INGERSOLL 32x30x12' adj. rail slab, M.D.
SUNDSTRAND Model 3A Duplex, latest type
TAYLOR & FENN M80 Duplex Spline, latest

MILLING MACHINES—Plain

BRIGGS Type A, Latest Type
BROWN & SHARPE #3B, TIMKEN, Latest Type
BROWN & SHARPE #12 Timken Bearing, Latest Type
BROWN & SHARPE No. 13-B, M.D.
CINCINNATI #4 Dial Type; Timken; latest
CINCINNATI 0-8 Automatic rise and fall, Latest
CINCINNATI 1-12 TIMKEN, latest type
CINCINNATI #4 TIMKEN, M.D.
CINCINNATI 3, 4S, 5, M.D.
CINCINNATI 24" automatic, TIMKEN, M.D.
CINCINNATI 4-36 hydromatic, Latest Type
KEARNEY & TRECKER 12IS, TIMKEN, latest
KEARNEY & TRECKER #3, 4, Heavy, Timken, M.D.
KEMPSMITH #2, #4 Maximiller, Timken, latest type
LEBLOND #4 heavy duty, M.D.
SUNDSTRAND #2 Electro-mill, Latest Type

MILLING MACHINES—Thread

HANSON & WHITNEY 4"x9", Latest Type
MOREY 12x30, 60, 120, 190, Latest Type

MILLING MACHINES—Universal

AMES Bench, M.D., latest type
BROWN & SHARPE #3A, M.D.
CINCINNATI #3 Universal, Dial Type, Timken, latest
HARDINGE Model UM, Timken, latest
KEARNEY & TRECKER #3H, Timken, latest
VAN NORMAN #12, #22L, TIMKEN, Latest Type

MILLING MACHINES—Vertical

BRIDGEPORT vert. turret, Latest Type
BROWN & SHARPE #5 M.D.
CINCINNATI #2, #3, #4 Dial Type; Timken; latest
CINCINNATI #08, TIMKEN, Latest Type
CINCINNATI #3, #4 High-Powered, M.D.
COCHRANE BLY #14 univ., M.D.
GORTON 8D superspeed, latest type
REED PRENTICE #5 die sinker, latest type
REED PRENTICE 3VG with Hydraulic Duplicator Timken Bearing, Latest Type
SUNDSTRAND #3A, rotary, Latest Type

PLANERS

CHANDLER 36x36x20', 4 heads, AC, M.D.
CLEVELAND 48"x60"x20' Openside; 3 heads; A.C. M.D.
DETRICK & HARVEY 48x48x16', 4 heads, Hyd.
DETRICK & HARVEY 84"x84"x18'; 4 heads; DC; M.D.
GRAY 36"x36"x8'—2 heads, Max. service, D. C. variable M.D.
NILES BEMENT POND 48x48x16', 2 heads, AC, M.D.
OHIO 42x42x20'—2 heads, AC, M.D.

PRESSES

BIRDSBORO 325 ton, vert. hyd., Latest Type
CHAMBERSBURG 50 ton, vert. hydro-pneumatic
CHAMBERSBURG 200 ton, horiz. straightening, M.D.
CLEARING Type DS-1125-32 dbl. action, 125 ton, Latest Type
FERRACUTE #DG-55, 75 ton drawing, Latest Type
GLEASON 15 ton Quenching, M.D.
HANNIFIN 15 ton moulding, Latest Type
NIAGARA #3 inclinable, M.D.
NILES 200 ton Horizontal Wheel, M.D.
TAYLOR & FENN #11A spring, Latest Type
TOLEDO #2 inclinable, M.D.
WATSON & Stillman 20 ton hyd. straightening, Latest

SHAPERS

CINCINNATI 26" Travel Head—2 head type B
LAMAIRE 18' Vert. Hydraulic—latest type
LYND FARQUHAR 26" openside, M.D.
MOREY 8", 10", 14" Vertical, latest type
MORTON 48" draw cut, M.D.
NEWTON 15" vert. slotter, DC, M.D.
NILES 18" vert. slotter, DC, M.D.
ORMEROD 8" Vertical, latest type
PRATT & WHITNEY 6", 10" Vertical, M.D.

MISCELLANEOUS

AJAX 1½", 3½" Forging and Upsetting; M.D.
BARNES #172, Vertical Hone, latest type
BAKEWELL #1 Tapper; M.D.
BILLINGS & SPENCER 1500 lb. Board Drop Hammers
CLEVELAND 12"x16' centers—Cutter Reliever, M.D.
DETROIT #DH-1, PH-1 BRINELL tester, Latest
LANDIS (Landmaco) 1" Bolt Threader, Latest Type
MARVEL #6A Hack Saw, latest type
MORTON 60" combination traveling hd., planer, miller and borer, M.D.
NAZEL, #4B Pneumatic Hammer, M.D.
NIAGARA #03, ⅛x36" shear
NORTON #2F Vertical Lapper—Latest Type
PITTSBURGH Type A-2 Brinell tester, Latest Type
PORTER CABLE Type AG-8 Sander, Latest Type
PRATT & WHITNEY (KELLER) Type BL-2416 Copying, latest type, 2 & 3 Dimensional
PRATT & WHITNEY #1A Jig Borer, M.D.
PRATT & WHITNEY 3B Jig Borer; latest type
PRATT & WHITNEY (KELLER) Type G Copying; latest type 2 Dimensional
RIEHLE 1500 lb. tester, Latest Type
ROCKWELL Model #30R tester, Latest Type
TINIUS OLSEN Model 3A tester, Latest Type
TANNEWITZ GH-56 Band Saw, latest type
VAPOR BLAST Model B-20 Liquid hone
WHITON 8"x108" duplex centering, Latest Type
WYSON & MILES #283-B borer, Latest Type

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Distance between centers—12'
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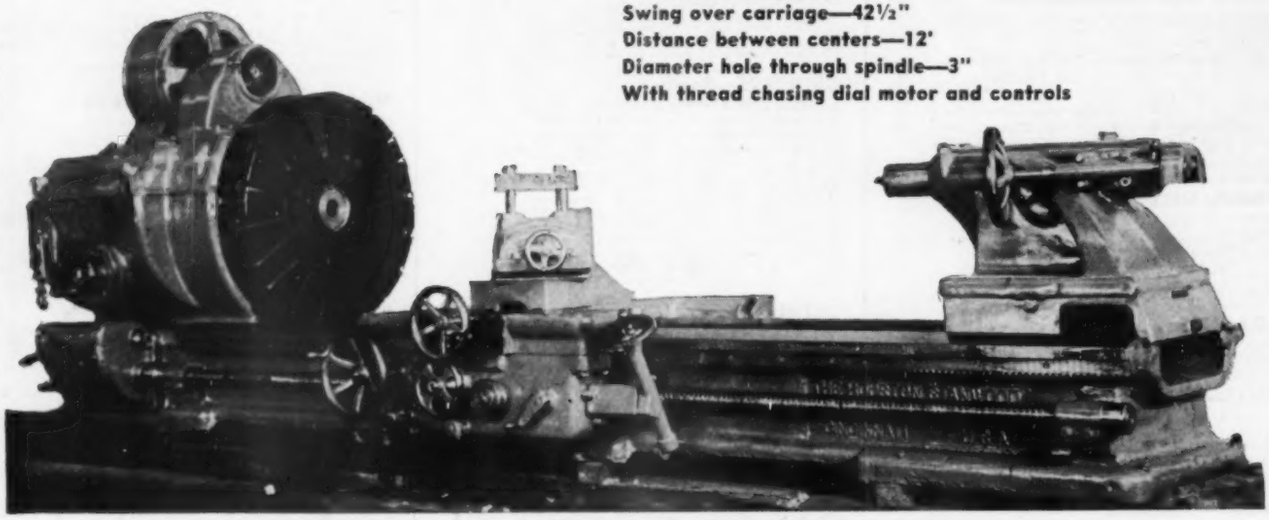
With thread chasing dial motor and controls



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2000 TON HPM. FASTRAVERSE HOBBING PRESS
7" DETRICK & HARVEY PLANER TYPE BORING MILL

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AVAILABLE FOR IMMEDIATE DELIVERY

#3 Waterbury-Farrel punch press, app. cap. 20 ton, stroke 2½", ram adjustment, 60 strokes per min., shutheight 6½", bed size F to B 10½", R to L 14½", 1 HP motor, like new $475.00

#6600 Waterbury-Farrel punch press, cap. 56 ton, vertical back geared, open back, straight sided, 6" stroke, 60 strokes per min., 20" shut height, distance between uprights, 46", bed size 10"x45", 5 HP motor, push button switches, V drive, late type $1750.00

#PG-6 Ferracute punch press, geared, 1¾" stroke, bed area R to L by F to B 34¾x23. Opening in bed R to L by F to B 16x14. Slide adjustment. Height Overall 103" $2750.00

U. S. Multimiller, model MM-1-5-2. Table 6"x21½", automatic vertical motion of spindle head 2", horizontal adjustment of spindle assembly 2¼", motorized, automatic lubrication system, Coolant pump and tank, little used late model machine.....$750.00

#5 Waterbury-Farrel blanking and cupping press, 4" stroke, open back, 25"x12" bed area, app. 20 ton cap., adjustable ram, ½ HP motor $380.00

#35P Toledo punch press, gap type, flywheel 48"x7", bed size 27"x18", stroke 1¾", 15" from bed to bottom of ram ways, 10 HP motor, Pitman strap and eccentric just rebuilt. $1500.00

Model RA-6, six-spindle Acme-Gridley automatic, 9/16" bar cap., including tooling and equipment, serial #22377A, practically new. $3950.00

Progressive spot welder, 75 KVA gun type with air control, model S1DS5, size 200, serial #15828 .....$475.00

Hayes electric heat treat furnace, type HG64, with controls, ser. #3496.....$350.00

#5 Long and Alstatter gate shear, shear blades 42"x3½"x⅜", shearing capacity ½" thick copper.....$675.00

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Bor. Mill. Hor. 3" G & L. M.D.
Boring Mills, 24"-36"-42"-52"-72"-96"
Drills, Radial 3'-4'-5'-6' Cin.-Bick.
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Millers, Plain No. 3 K & T, No. 4 Cin.
Millers, Vertical No. 3 B & S & No. 4 Cin.
Profiler, #13 P. & W., B.D.
Shapers, 16"-20"-24"-36".
Shaper, 36" Morton Draw Cut.
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ENGINE LATHES

13x30" centers Pratt & Whitney Model B Geared Head, m.d., taper
13x48" centers Pratt & Whitney Model B Geared Head, m.d.
14"x30" centers American "Pacemaker", m.d., latest
14"x30" Lodge & Shipley Selec. Head, m.d., latest
14"x6' bed endey Geared Head, m.d., Taper
14"x6' Pratt & Whitney, cone
14"x6' Sidney Geared Head, m.d.
14"x8' Pratt & Whitney, cone
15"x'6' LeBlond Geared Head, Timken, m.d., late
16"x36" centers Pratt & Whitney Geared Head, m.d., taper
16"x6' Bradford, cone, taper
16"x6' Hendey Geared Head, m.d., taper
16"x6' Lodge & Shipley Selec. Head, m.d.
16"x6' Monarch Geared Head, m.d.
18"x30" centers American Geared Head, m.d. in base
18"x7' Hendey Geared Head, m.d., taper
18"x8' American Geared Head, m.d., taper
18"x8' Bradford, cone, taper
18"x8' Champion, cone
18"x8' Greaves-Klusman, cone, taper
18"x8' Hendey Geared Head, m.d., taper
18"x8' Lodge & Shipley, cone
18"x12' LeBlond, cone
19"x10' LeBlond Geared Head, m.d.
21"x18' LeBlond, cone
22"x70" centers Greaves-Klusman Geared Head, m.d., taper
22"x8' Lodge & Shipley, cone
23"x12' LeBlond Geared Head, m.d., taper
24"x10' American, cone, taper
24"x10' Greaves-Klusman Geared Head, m.d., taper
24"x10' Hendey Geared Head, m.d.
24"x10' Lodge & Shipley, cone
24"x12' LeBlond, cone
24"x14' Boye & Emmes, cone, taper
26"x16' Boye & Emmes, d.c. m.d., taper
30"x12'6" Niles-Bement-Pond, m.d., taper
36"x12' Lehmann Hydratrol Geared Head, m.d., tpare, latest
36"x21' centers Putnam Geared Head, m.d.
36"x32' centers Putnam Geared Head, m.d.
36"x36'6" bed Niles H.D., m.d., geared head, latest
50"x204" centers LeBlond H.D. Geared Head, m.d., taper, latest

MULTIPLE SPINDLE DRILLS

No. 3 Baush, m.d., 16x30" head, 15 spindles
D13H Natco Hydraulic, m.d., head 18x12", 10 spindles, tapping
No. 16 Fixed Center Foote-Burt, 8 spindles
3 spindle 12" Rockford Gang, m.d.
4 spindle 21" Cincinati-Bickford Gang, d.c. motor
4 spindle Foote-Burt Rail, m.d.

RADIAL DRILLS

3' American Sensitive, belt
4' American Sensitive, d.c. motor on arm, inclosed head
4' Niles-Bement-Pond Semi-Universal, m.d.
5' American Triple Geared, 13" col.
5' Cincinnati-Bickford Plate Hole Driller, m.d. on arm
5' Cincinnati-Bickford Full Universal, gear box
5'-13" Cincinnati-Bickford Plain, m.d.
5' Prentice Plain, m.d.
6'-15" Carlton Plain, gear box
6' Cincinnati-Bickford Plain, m.d. on base
6' Niles-Bement-Pond Semi-Universal, m.d.
6'-16" Western Plain, m.d.
8'-19" American Triple Purpose, d.c. motor on arm, 1942 machine
8'-16" American Triple Purpose, m.d. on arm
10'-22" American Triple Purpose, d.c. motor on arm, p.r.t.

UPRIGHT DRILLS

21" Cincinnati-Bickford Super-Service, m.d.
28" Cincinnati-Bickford, m.d., tapping
30" Rich H.D., m.d.
32" Aurora, belt
40" Aurora, m.d.
H3 Barnes Hydram, m.d.
D4 Colburn, H.D., m.d.
D8 Colburn H.D., m.d.
No. 25 Foote-Burt H.D., m.d., compound table
No. 36 HO Baker H.D., m.d., 40" circular table, latest

GEAR SHAPERS

No. 6, 61, Fellows, belt
No. 7, 7A Fellows, m.d.
No. 18 Fellows Gear Finishing Machine, m.d.
No. 61A, 65A3, 615A, 645A3 Fellows, m.d., latest types
No. 64-S Fellows, m.d.
No. 71A Fellows, m.d.

PLANERS

24"x24"x6' Gray, 1 head, belt
24"x24"x10' Whitcomb-Blaisdell, 2 heads, belted m.d.
30"x30"x10' Gray, 2 heads, belt
30"x30"x14' Gray, 2 heads, belt
32"x32"x16' Gray, 2 heads, belt
36"x36"x10' Niles, 2 heads, belt
36"x36"x18' Niles-Bement-Pond, 2 heads, reversing m.d.
36"x36"x20' Cincinnati, 2 heads, belt
36"x36"x20' Gray, 2 heads, belt
36"x38"x20' Gray Spiral Drive, 2 heads, belt
42"x42"x26' Gray, 2 heads, belted m.d.
48"x48"x12' Gray Open Side, 1 rail head, 1 side head, reversing m.d., late
48"x48"x18' Detrick & Harvey, 4 heads, reversing m.d.
48"x48"x28' Cincinnati, 4 heads, reversing m.d.
48"x48"x30' Cincinnati, 4 heads, m.d.
48"x48"x32' Niles-Bement-Pond, 4 heads, reversing m.d.
48"x48"x40' Sellers, 2 heads, reversing m.d.
56"x42"x10' Cincinnati, 4 heads, m.d.
62"x62"x40' Cincinatti, 4 heads, reversing m.d.
66" 60"x40' Niles-Bement-Pond, 4 heads, reversing m.d.
72"x72"x24' Niles-Bement Pond, 4 heads, reversing m.d.
72"x72"x36' Niles, 4 heads, reversing m.d.
96"x72"x18' Pond, 4 heads, belted m.d.
Type P10 Coulter Shaper/Planer, m.d.

SAWS

6x6" Peerless Hack Saw, m.d.
6x6" Racine Hack Saw, s.p.d.
13x13" Peerless Universal Shaping Saw, m.d.
No. 3 and 8 Nutter & Barnes Cold Saws
No. 6 Cochran-Bly Cold Saw
No. 138 Espen-Lucas Cold Saw
Gustav Wagner Cold Saw, m.d., 28" blade
7½ H.P. Cincinnati Elec. Tool Co. type JCAW Abrasive Cut-off Machine

TAPPING MACHINES

No. 1 Bakewell, m.d., latest
No. 2 Bakewell Precision, m.d., latest
No. 10 Kaufman High Duty Oscillating Pneumatic, m.d., latest
No. 5 Webster & Perks 5 spindle Vertical Nut, cone

SLOTTERS

12" Bement-Niles, m.d.
15" Canada, m.d.
48" Niles-Bement-Pond Geared, m.d.

AUTOMATICS

4 spindle ⅞" Acme-Gridley Automatic, m.d.
4 spindle ⅞" Cleveland Model M, bar, m.d.
4 spindle 2" Cleveland Model M, m.d., bar
4 spindle 2¼" Cleveland Model K, m.d., bar
2¼" Gridley Single Spindle, m.d., bar
2¼" Cleveland Model A, m.d., bar
2½" Cleveland Model A, m.d., bar
4¼" Cleveland Model A, m.d., bar
4½" Cleveland Model A, m.d., bar
5½" Cleveland Model A, m.d.
6" Cleveland Model A, m.d.
7¾" Cleveland Model A, m.d.
No. 6A Potter & Johnston, m.d., chucking
No. 6C Potter & Johnston, m.d., chucking
Jones & Lamson 20x25", m.d., late
14" Fay, m.d., Flanders Type

HORIZONTAL BORING MILLS

2½" Cleveland, m.d.
No. 31 Lucas, 3" bar, m.d.
No. 32 Lucas, 3½" bar, m.d.
No. 33 Lucas, 4½" bar, m.d.
3½" Cincinnati-Gilbert Floor Type, m.d., latest
4" bar Detrick & Harvey Floor Type, m.d.
4" Niles, table type, m.d.
4½" Niles, table type, m.d.
5½" Niles, table type, m.d.
10" bar Sellers Floor Type, m.d., no floor plate
Morton 60" stroke Horizontal Boring, Milling and Drilling and Draw-Cut Traveling Head Planer, m.d.

GEAR GRINDING MACHINES

No. 13LS Fellows Lapper, m.d.
9" Pratt & Whitney Hydraulic Spur Gear Grinder, m.d.
10" Pratt & Whitney Hydraulic Spur & Helical, m.d.
No. 2HS Lees-Bradner Spur & Helical, m.d.

GEAR HOBBING MACHINES

No.12 H Gould & Eberhardt, m.d.
No. 36H Gould & Eberhardt, m.d.
No. 12 Barber-Colman Long Bed Type, m.d.
Type T Barber Colman, m.d., latest
No. 34, 44 Brown & Sharpe, m.d.
48" Cleveland, m.d.

GEAR CUTTING MACHINES

No. 3—26" Brown & Sharpe Spur, m.d.
No. 6—60" Brown & Sharpe Spur, m.d.
Cross Gear Tooth Rounder, m.d.
3 spindle No. 36BM Gould & Eberhardt Vertical Rougher, m.d.
No. 1 Brown & Sharpe Spur Gear Tester
National Broach & Machine Co. Gear Tester
3" Gleason Straight Bevel Gear Generator, m.d.
8" Cleason Mfg. Type Straight Bevel Gear Generator, m.d.
11" Gleason Straight Bevel Geat Generator
12" Gleason Straight Tooth Bevel Gear Generator, m.d.
Cincinnati Gear Burnisher, m.d.
Gleason Spiral Bevel Gear Rougher, s.p.d.
Gleason Testing Machine, m.d.

CENTERLESS GRINDING MACHINES

No. 2 Cincinnati, Filmatic Spindle, m.d., late
No. 2 Cincinnati, m.d., older types
No. 3 Cincinnati, Filmatic Spindle, m.d., long bar attachment, late
Cincinnati Valve Seat Grinder, m.d., cap. ⅜" valve stems

CYLINDER GRINDING MACHINES

No. 50 Heald Hydraulic, m.d., new , latest type
No. 55 Heald, m.d.
No. 73 Heald Airplane Cylinder, m.d., new, latest type

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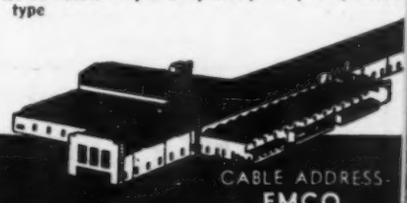

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3'9" AVEY — Sensitive — RADIAL — Belt Drive.
3' FOSDICK — Square Column — Radial — BD

GEAR EQUIPMENT

3" GLEASON — Gear Generator — Straight Bevel — LATE TYPE
3" GLEASON — Gear Generator — Spiral — LATE TYPE

GRINDERS

#2 CINCINNATI — Tool & Cutter — 220/440/3/60 — Universal — Large assortment of accessories — LATE TYPE.
7"x11" LEACH — Plain Cylindrical — M.D. — 220/3/60 LATE TYPE — 1942 Mfg.
6"x18" MONARCH — Surface — Hand feed — XLO mtzd. Spdle — 550/3/60 — with chuck.
#60 HEALD — Cylinder.
10"x24" NORTON — Cam Grinder — Mtzd.
6"x32" NORTON — Plain Cylindrical — MD — 220/440/3/60.
#70 HEALD — Internal — 220/3/60 — MD.
#2 CINCINNATI — Centerless — "Filmatic" — Late Type
12"x36" NORTON Universal Multi-purpose Type C Hydraulic — LATE TYPE

LATHES & TURRETS

20"x54" REED-PRENTICE — 16 speed — Geared Head — Taper Attach. — 220/440/3 — with additional equipment — LATE TYPE — 1942 Mfg.
14"x30" LODGE & SHIPLEY — 12 speed — motor in base — TA — chuck — stops — 4 way tool post — 220/440 — other equipment — 1941 Mfg.
14x30" REED-PRENTICE — GEARED HEAD — 16 speed — chucks — collets — Sjorgren chuck — other new accessories — Late Type — 1941 — Factory guarantee
#2 BARDONS & OLIVER — Universal Turret — 220/3/60 — tooling — collets — tool holders — Late Type
14"x6' HENDEY — Geared head — factory MD — chucks — less mtr.
#2 WARNER & SWASEY — PF to turret — Cross slide — BD — arr. MD.
#3 WARNER & SWASEY — Universal Turret — late type — chucking
14x8' Monarch — Engine — BG — Chuck, collets, motorized, Turner drive
12"x30" MONARCH — Model CKK, 550/3/60 — LATE TYPE
14"x54" REED PRENTICE Model AA 16 speed — Taper Attachment — LATE TYPE

MILLING MACHINES

#2 BROWN & SHARPE — Plain Horizontal — Light Type — Mfg. 1943
#3K K&T "Milwaukee" Plain Horizontal — Power rapid traverse — 220/440/3/60 — motor in base —LATE TYPE — 1943 Mfg.
#3H K&T "Milwaukee" Plain Horizontal — Power rapid traverse — 220/440/3/60 — motor in base — LATE TYPE — 1943 Mfg.
#2K K&T "Milwaukee" Plain Horizontal — Power rapid traverse — 220/440/3/60 — motor in base — LATE TYPE — 1942 Mfg.
#34 OHIO — "Osterlein" — Universal — Belt drive — New dividing heads.
#1H K&T "Milwaukee" — VERTICAL — Power rapid traverse — Power feed to head — Motor in base — LATE TYPE — 1942 Mfg.
#2H K&T "Milwaukee" — VERTICAL — Power rapid traverse — Power feed to head — Motor in base — LATE TYPE — 1942 Mfg.
#2 KEARNEY & TRECKER "Milwaukee" — Plain Horizontal — motorized — 220/3/60 — double overarm — vise — new Bridgeport Milling attachment — new dividing heads.
#4 BURKE — Universal — 20" table — 220/3/60 — 28" column — Vertical Milling attachment — swivel vise — arbors — NEW.

SAWS

#4C COCHRANE-BLY — Cold — inserted tooth blade — MD — 220/3/60.

SCREW MACHINES

#2 BROWN & SHARPE — hand — wire feed — late type
#0G BROWN & SHARPE — Fully automatic — Vertical slide attachment — Serial No. 7500.
#00G BROWN & SHARPE — Fully automatic — Serial No. over 11,000 — Motor driven slotting attachment — Swing stop and equipment — LATE TYPE.
#0 BROWN & SHARPE — Fully automatic — Belt drive.

SHAPERS

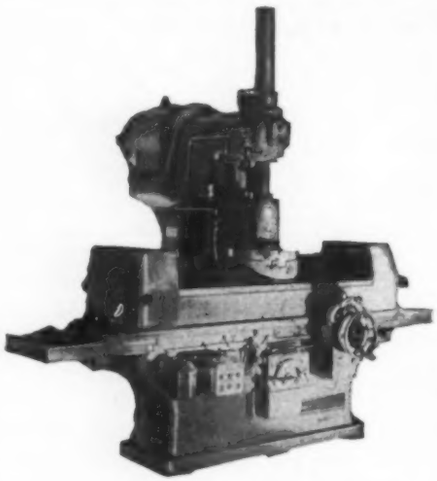
28" AMERICAN — Back geared — Power feed to head — Single pulley drive.
24" GOULD & EBERHARDT — Crank — Motorized with 4 speed drive.
7" LOGAN — Floor type — 110/1/60 — NEW.
16" Stockbridge Crank backgeared CD — with vise

MISCELLANEOUS

PLANER — Whitcomb — 24"x24"x6' — Arr. for motor drive — Less elec. equip. — 1 rail head.
Boring Mill — Universal — 3" bar — horizontal — MD — 220/3/60.
GEAR CUTTER — Henry Reuson — #6 — 72" spur.
BRAKE—Vulcan 8' length Power Press, Cast Iron.
SHEAR — Whitney 42", 16 ga. 220/3/60, NEW
BUFFERS — CINCINNATI — TYPE DKA — 220/3/60 — 2 HP — NEW

UNITED MACHINERY & TOOL CORPORATION

34 HERMAN STREET — WORCESTER 8, MASS.



LATEST TYPE Pratt & Whitney 14" x 60" HYDRAULIC VERTICAL SURFACE GRINDER

Like New

OTHER FINE MACHINE TOOLS AVAILABLE

2—#2H Kearney & Trecker Univ. Millers, 1944
#2A Brown & Sharpe Univ. Miller, Timken
#2B B&S plain Miller, mtr. in base
6"x30", 10"x30" Norton "C" Hydr. Grinders
2—36"x36"x14' Cincinnati "Hypro" Planers
#32 Lucas 3¼" Horiz. Boring Mill
#2 Kent Surface Grinder, 1943
#11 Blanchard Rot. Surface Grinder, '41
#13 B&S Universal Grinder, 1943
3—#2G B&S automatics, Mtr. in base
#40 Cincinnati 10'x12 ga. Press Brake
36" DoAll Zephyr Saw, 1947
#2H Kearney & Trecker Vert. Mill, '42
16" DoAll Contour Saw, Late

HUNDREDS OF OTHER TOOLS IN STOCK

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THREE OF HUNDREDS OF REYNOLDS USED MACHINERY BARGAINS!

#4 Fellows Enveloping Geared Generator, model #4ENV, serial #19959, late model, 220-3-60 AC. In like new condition. Special low price..... $500.00

24" x 24" x 8' Whitcomb second belt drive Planer arranged for motor drive. A real bargain.. 650.00

Several U. S. #MM1-16 Multi Milling Machines, late models. PRICE, each 250.00

REYNOLDS MACHINERY CO.

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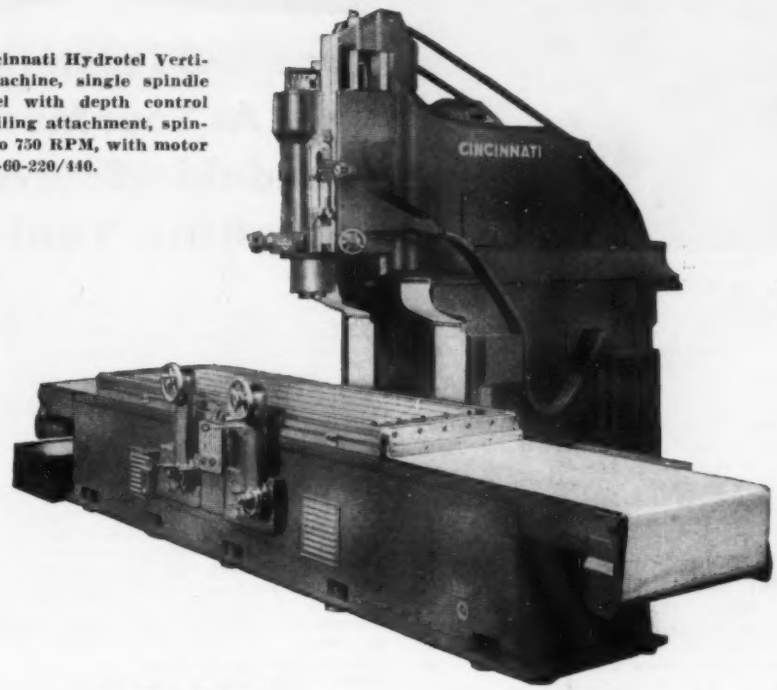
QUALITY *Machine Tools* NOW IN STOCK

28 x 60" Cincinnati Hydrotel Vertical Milling Machine, single spindle selective model with depth control and 360° profiling attachment, spindle speeds 30 to 750 RPM, with motor and controls 3-60-220/440.



AUTOMATICS

2G Brown & Sharpe, H.S. 1¼" capacity. New in 1943.
9/16" RA-6 Acme-Gridley. New in 1943.
1¾" Conomatic 8-spindle. New in 1942.
5¼" Cleveland Model A, single spindle.
16" x 33" Fay Automatic Lathe. 1941.
★Bullard Multaumatic, six spindle model D, single index. Late model.

BORING MILL

★ Universal Horizontal, 4" bar, table type, with facing head, rotary table, boring bars, motor and control. New in 1943.

BROACHES

No. 2SL LaPointe Hydraulic Horizontal. New in 1942.
No. CPC 6-30 LaPointe Hydraulic Vertical. New in 1941.
No. CPC 6-36 LaPointe Hydraulic Vertical. New in 1943.

DRILLS

4' Dreses Radial, 11" column.
6' American radial, 17" column.
No. H3 Barnes Hydram, 8 speed. 1942.
42" Cincinnati-Bickford, single spindle.
No. 201 Barnes Geared Drill. New in 1943.
No. 3 Avey, three spindle, heavy duty.
KH 2 Allen Sensitive Drill, 4 or 6 spindle. New in 1943.
No. 3 Baush Multiple Spindle.
Barnes Horizontal Deep Hole, 2 spindle.
Taft Peirce Horizontal, double end.

GEAR CUTTERS

No. 6 Gleason Gear Tester.
No. 7A, 7125A Fellows Gear Shapers.
No. 615A, 645A3 Fellows Gear Shapers.
No. 12 Barber Colman Hobber.

GRINDERS

No. 2 & No. 3 Cincinnati Centerless, Filmatic spindle. 1941.
14" x 48" Cincinnati Universal, Filmatic bearing, internal spindle. New in 1942.
No. 3 Brown & Sharpe Universal. New in 1943.
10" x 72" Norton Cylindrical.
10" x 36" Landis Hydraulic. New in 1943.
No. 22 Heald Rotary Surface Grinder. New in 1943.
No. 18 Blanchard, 30" chuck. 1942.
30" x 24" x 192" Mattison Hydraulic Surface Grinder. New in 1943.
14" x 16" x 60" Mattison Surface.
3B Abrasive, with chuck. New in 1943.
6" x 12" x 18" Thompson Surface Grinder. New in 1942.
No. 16CP16 Bryant Hydraulic Internal Grinder. New in 1942.
No. 75A Heald Internal. New in 1943.
No. 72A3 & 72A5 Heald Sizematic. 1943.
★ No. 74 Heald Internal Grinder, with 6 foot extension on bed for long work, adjustable work headstock on swivel table for long tapers.

LATHES, ENGINE

Hendey 12" x 30", g.h.
Reed Prentice, 14" x 30" g.h.
Lodge & Shipley Tool Room, 14" x 54", rel. att. New in 1943.
Reed Prentice 14" x 78" Toolroom. 1943.
American Pacemaker, 16" x 30". 1942.
Reed Prentice 16" x 54". New in 1943.
Sidney 18" x 54". New in 1943.
Lodge & Shipley 20" x 48". New in 1943.
Monarch, 24" x 36", g.h.
★ Bertram 28" x 240" "Timesaver", two carriages, with rapid traverse. Canadian made from Niles patterns. 1942.
American 36" x 12' between centers.
Lodge & Shipley 48" x 54", cone driven.
Carroll Jamieson 18" x 5', C.D.
South Bend 14½" x 6'. New in 1944.
IMP Model Lo-Swing.
Lipe Carbomatic, 15" x 30".
LeBlonde Production, 17" x 30".

LATHES, TURRET

Warner & Swasey No. 4A, with chuck, 7½" hole.
Warner & Swasey No. 2A, preselector. New in 1943.
Gisholt No. 2L, cross sliding turret. 1943.
Gisholt No. 1L, hydraulic speed selector. New in 1943.
No. 1S Acme Universal, saddle type.
Gisholt No. 5 Universal, Hydraulic speed selector. New in 1944.
Foster No. 5 Universal, Bar feed. 1943.
Warner & Swasey No. 4 Universal, preselector. New in 1943.
Gisholt No. 4 Universal, Hydraulic speed selector.
Warner & Swasey No. 3 Universal, two speed. New in 1942.
Bardons & Oliver No. 3 Universal, motor in base. New in 1941.
Warner & Swasey No. 2, oversize. 1942.
Bardons & Oliver No. 4, bar feed. 1941.
★ Bullard New Era VTL, 36" and 42".

MILLS

★ Cincinnati No. 4 Universal, High Speed Dial Type with rotary table, vertical attachment, slotting attachment, dividing head, motor and control. New in 1942.
Cincinnati No. 2MH Universal. 1942.
Milwaukee No. 2H Universal. 1944.
Van Norman No. 28U Universal.
Brown & Sharpe No. 3B Plain. 1943.
Brown & Sharpe No. 2B Plain.
Cincinnati No. 2MH Plain, latest model.
Milwaukee No. 2HL Plain with vert. att. New in 1943.
Milwaukee No. 3H Vertical, latest model.
Milwaukee No. 2K Vertical. New in 1942.
Cincinnati No. 08 and 2-18 Rise and Fall.
Cincinnati No. 1-12 Automatic.
Cincinnati No. 3-36 & 4-36 Hydromatic.
DeVlieg Supermill No. 31B.
Whitney Hand Mill, No. 6.

MISCELLANEOUS

Buffalo No. ½ Universal Ironworker.
Racine 10 x 10 Hydraulic Saw.
Bertsch 6' x ½" Bending Roll.
No. 26F Norton Hydrolap.
No. 5B Standard OBI Press. New.
No. 8-6 Zeh & Hahneman S.S. Geared Press.
Pratt & Whitney Profiler, No. 12B.
Tapper, Leland Gifford 3' Radial, No. 3 MT. New in 1941.
24" Cincinnati Worm Feed Rotary Table.
Dodds Dovetail Machine, 15 spindle.

PLANERS AND SHAPERS

Cincinnati Planer, 42" x 42" x 20', D. C.
12" Vernon Shaper. New in 1941.
Gould & Eberhardt 16" Shaper, M. D.
Cincinnati 20" Shaper, Universal table. New in 1943.
Cincinnati 24" Shaper. New in 1943.
Cochrane & Bly No. 14 Vertical Shaper. New in 1942.
Pratt & Whitney 6" Vertical Shaper. New in 1943.

ALL MACHINES MAY BE INSPECTED UNDER POWER IN OUR WAREHOUSE

INDIANAPOLIS MACHINERY & SUPPLY CO., INC.
High Quality NEW, USED & REBUILT Machine Tools
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MEXICO OFFICE: HIDALGO ORIENTE 2-535-B, MEXICO, D.F.

Huge Rebuilding Facilities

Set BOTWINIK Apart As Your Most Dependable Source Of Machine Tools

LATHES

1—Lehman 24"x14' selective gear head Lathe, M.D., sw. over ways 27", dist. betw. cens. 92", 16 spdle speeds.

Hendey 12", 14" 16" and 18" Tool Room Lathes, M.D. 6', 8' and 10' beds.

McCabe 24"x40"x12', dbl. spin., motor driven, Eng. Lathe; sw. over top spin. 41¾", sw. over lower spin. 24½", dist. betw. cens. 84".

1—Bridgeford 36"x56', 15 speed, grd. hed., Eng. Lathe, M.D. AC elect. equip. power rap. trav. to carr., compound rest, 2 steady rests, sw. 38" over bed, 26" over carr., dist. betw. cens. 48', mtzd apron and taper attmts.

VERT. BOR. MILLS

2—Bullard 36" "Spiral Drive", Vert. Bor. Mill, face of turret to tbl. 34", clear under cross rail 27¼", vert. trav. of turret 26⅜", clear under S.H. slide 16", 3 and 4 jaw chuck, approx. wght. 17,500 lbs.

1—Bullard 24" "New Era Type", Vert. Bor. Mill, capac., 26" diam., 20" high, 28" under turret face, 2 jaw chuck, coolant, M.D., weight approx. 9,000 lbs.

1—Bullard 36" "New Era Type", Vert. Bor. Mill, cap. 38" diam. 24" high, 25" under turret face, 4 jaw chuck, coolant, M.D. weight approx. 14,000 lbs.

1—Bullard 42" "New Era Type" Vert. Bor. Mill, with side hed. coolant crowning attmt., 4 jaw type chuck, capac. 44" diam., 33" cross rail, 43½" under turret face, M.D.

PLANERS

1—American Fndry and Mach. Co. 30"x30"x10', 1 hed. on cross rail, 1 side hed. Openside Planer, M.D.

2—Woodward-Powell 72"x72" Planer, with 12' and 16' beds., M.D.

MILLERS

1—B. & S. #1½A Bk. Grd. Constant Speed, Univ. Miller, tbl. wkg. surf. 36¼"x10¾", power feeds long. 24½", cross 7½", vert. 19", AC motor driven.

Cin. #5-60 Duplex Tracer-controlled Hyd. Miller, tbl. wkg. surf. 20"x78½" cross range left hand quill 8", right hand quill 8"; vert. movement of spindle, tracer or manual control 13¼".

1—Cin. 28"x60" Vert. Hydro-Tel Milling Machine, very latest type, tbl. wkg. surf. 28"x 83"; range: long. 60", cross 24", vert. trav. of spin. hed. 14"; power rapid trav.

Becker #2 Vert. Miller, M.D. compl. with rotary tbl. and draw-in collet attmt; range: long. 12", cross 11", vert. 10".

GRINDERS

1—Hill-Acme Hydraulic Surf. Grinder, capac. 18"x 24"x96", horiz. spin., with mag. chucks, latest type.

1—Blanchard #16 M.D. high power Vert. Surface Grinder, cap. 30" diam. x 13"; 8 chuck speeds, 5 to 28 RPM, 25 H.P. motor.

Blanchard #11 Rotary Vert. Surf. Grinder; range 20" diam. x 8" high, 16" chuck, 1200 RPM, very latest type, used less than 3 mos.

Norton #2 Univ. Tool & Cutter Grinder, motor driven, late type, capac. 12"x28", long. tbl. trav. 24", cross 8".

1—Cincinnati #2 Centerless Grinding Machine with Filmatic Bearings, latest type; cap. short wk. 1/16" to 3½", cap. bar wk. ⅛" to 2" diam. . . . 18' long with bar grinding fixture, grinding wheel max. diam. 20", max. width 8".

MISCELLANEOUS

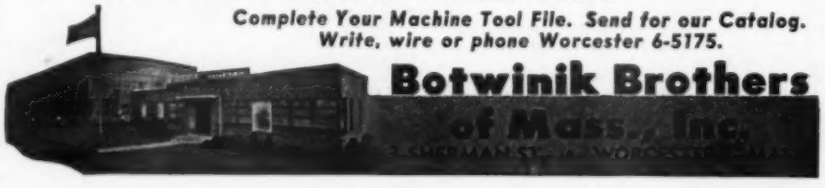
Campbell #302 Hydraulic Abrasive Cutting Machine, late type; wheel trav. 22", clearance from top of tbl. to bottom of 10" wheel—9".

1—P. & W. #BL Model 2416, Keller Duplicating Machine, tbl. wkg. surf. 42"x22", tbl. trav. horiz. 24", vert. 16", trans. 8"—very late type, 3 dimension complete with angle plates control cabinet.

1—Fairbanks-Morse, 2 cylinder, 2 cycle, 12"x15", Diesel Engine, Model No. 32E12, Generator capac. 76.8 K.V.A., 550V, 3 phase, 60 cycle, capac. 120 HP, used less than 7 mos.

Bliss #73½ straight side solid frame Power Press; width betw. uprights 18" stroke 3" width betw. gibs 10½" multi V-belt M.D.

Complete Your Machine Tool File. Send for our Catalog. Write, wire or phone Worcester 6-5175.



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CHERRY MANE ST. AT WORCESTER, MASS.

B4B NATCO 48-spdl. Holesteel Drill
3'-11" American Hole Wizard Radial
#12 Landis Centerless Grinder
6"x18" Norton "C" Hydraulic Grinder
#3—36" Cincinnati Plain HYDROMATIC Miller
#3HS Cincinnati Vertical Miller
#36 Hanchett Rotary Grinder, 30" Chuck
#1 Brown & Sharpe Wire Feed Hand Screw Machines.

ALL LATEST TYPE MACHINES

HAZARD BROWNELL

350 Waterman St., Providence 6, R.I.

National Bent Shank Nut Tappers—Battery of ⅝" and ⅞" Machines.

2 Landis ¾" Bolt Formers and Threaders, M.D.

1 National ½" to 1" Hot Bolt Head Trimmer

Woodward & Powell 42"x42"x36 ft. 4 Head Planer

Cincinnati 36"x36"x16 ft. Planer, M.D.

1 Lodge & Shipley 36" Swing by 44 ft. Bed, Selective Geared Q.C. Lathe, M.D.

National Machinery Exchange

128-138 Mott St., New York 13, N. Y.

MILES' QUALITY

Automatic, 2⅝" Acme Gridley 6 spindle, model RA6 with accelerated reaming in 4th & 5th positions and quite a little equipment. Serial No. 84243. New 1941.

Automatic, 1⅜" New Britain 6 spindle, model 61 with several sets of collets and tooling. New 1942 or 1943.

Automatic, two 16" Bullard 6 station Mult-Au-Matics arranged for power chucking (no chucks). Two compound and three plain tool slides, extra high columns. Serial Nos. 18767 and 22,209, new in 1942 and 1943.

Automatic, 16" x 33" Fay, serial No. 82797, new in 1943. Has hydraulic chuck, front and rear tool slides and hydraulic tailstock.

Air Compressor, 1118 cu. ft., 20" & 12" x 16" Worthington "Feather Valve" duplex 2 stage, serial No. 24189. Has 195 HP General Electric 440/60/3 synchronous motor directly on shaft.

Boring Mill, 100" Niles-Bement-Pond Heavy Pattern. Two swivel heads with power rapid traverse. 35 HP, 230 volt direct current variable speed motor. Serial No. 17552.

Gear Generator, 12" Gleason straight path two tool rougher, Serial No. 20332, new in 1943. Has hydraulic work clamping and control.

Grinders, 6"x18", 10"x18", 14"x36", 16x36" & 20"x48" Landis type C hydraulic. New from 1941 to 1943.

Thread Grinder, No. 33 Excello automatic, serial No. 4459, new in 1942. Also have No. 35 Excello, universal type and about same age.

Internal Grinders, Nos. 16CP16, 16-28, 16F28 and 24-36 Bryant. All built after 1941.

Surface Grinder, 12"x16"x48" Thompson hydraulic, serial No. 4C084, new in 1941. Has 12"x40" magnetic chuck, both hand and hydraulic cross feed.

Lathe, Turret, No. 1L Gisholt saddle type universal, serial No. 27-627, new in 1942. Has air chuck, some tooling. Also have Nos. 3, 4, 5 & 3AL Gisholt.

Lathe, Turret, 36" Bullard "Spiral Geared" vertical, serial No. 19262, new in 1942. Has 3 jaw chuck table, cutting lubricant system.

Miller, Thread, Model CT-36 Lees Bradner, serial No. CT141, new in 1942. Has 13" hole through spindle.

Miller, No. 28-60 Cincinnati Hydretel vertical, single spindle with down feed and hand controls. Serial No. 1H1V1L-313, new in 1942.

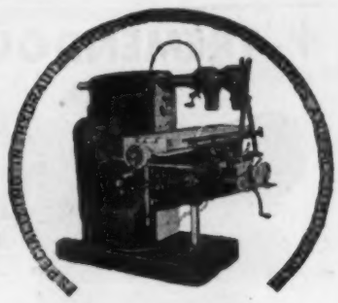
Millers, Cincinnati Hydromatic, most manufactured 1942 or later. Sizes: 3-24, 4-36, 4-48, 5-48, 56-72 and 56-90.

SEND FOR COMPLETE LIST

MILES MACHINERY CO.

SAGINAW, MICH.

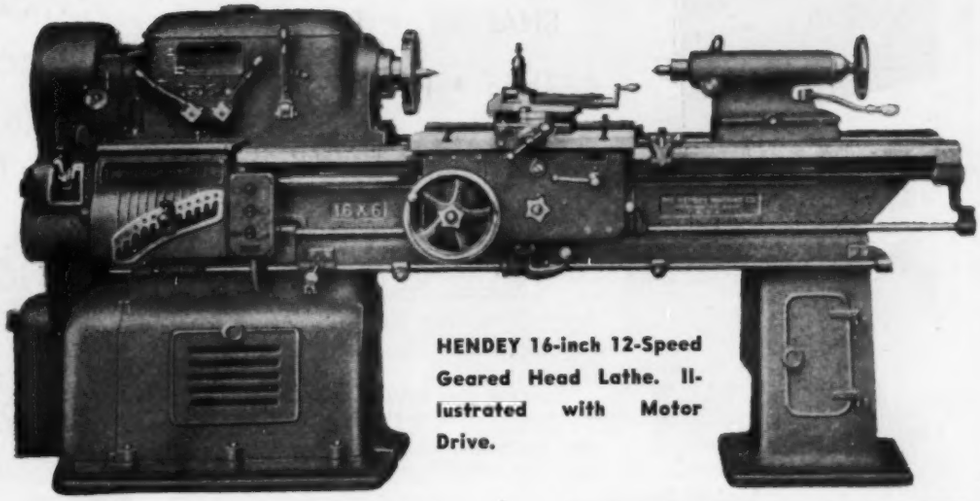
AARON VALUES IN MODERN TOOLS



SPECIALS

Clearing 90-10 Press Brake—10' 10 Ga.

Van Norman #12, 36
56 Ton Thomas OBI Press, New 1947
Gorton Duplicators and Vert. Millers
Gorton No. 3Z, 3L 1D, ME Engravers
Marvel 6A Hacksaw, M.D., Auto. Feed
Injection Moulders, Hydraulic Presses
Norton No. 2 Tool & Cutter Grinder, late
Bakewell No. 1 Tapper
Sellers Wet Drill Grinder 6G, late
Abrasive 6x18, 8x24 Surface Grinders
Conomatic 1⅞" 8 spindle, Late Type
Brown & Sharpe #5 Grinder Cyl.
Thompson Seam Welder Mod. 26, Rafter, New 1945



HENDEY 16-inch 12-Speed Geared Head Lathe. Illustrated with Motor Drive.

BORING MILLS

#0 Giddings & Lewis arr. M.D.
2½" Cleveland arr. M.D., 2½", 4" Bimsee
Niles-Bement-Pond 4" duplex, Universal 3"
66" Niles; 54" Colburn M.D. 2 hds.
Bullard New Era 24", 42", Vert. M.D.

TURRET LATHES

W. & S. Nos. 3, 4 Grd. Hd., Preselector
Gisholt No. 1L, 2L Univ. M.D., Late
Foster Nos. 4, 5, 6, 1B, 3B M.D. Univ.
J. & L. 2¼"x24", 3¼"x36"
Acme #2 M.D.
Oster 60i Rapidustion, Late
Hardinge ESM, 2nd operation, late

GRINDERS

Abrasive 3B 8"x24" Surf., #34 Vert.
#25 Gallmeyer & Livingston Hyd. Surface
#25A Heald, M.D. like new Rotary Surf.
No. 2 Cincinnati Centerless M.D.
B. & S. No. 2, 2B Surface, M.D.
P. & W. 14", B.D., Vert. Surface 19"x49"
Blanchard 30", M.D.; Modern 12x48" M.D.
Norton Hydraulic 12x18", M.D. Cyl.
Heald No. 72A3 Gagematic
Norton 50"x28' M.D. Roll Grinder
Landis Type A 6x20" Hydraulic, M.D. Cyl.
No. 55, 60, 65 Heald Int., M.D.
12" Heald Rotary, Arter 12" M.D.
B. & S. No. 10, 11, Cyl.; 1, 3 Univ.
Norton 6x18" Hyd. Surface, M.D.
Covel #91A Tool, New 1941, Cinn.
Hammond & Excello Floor Model

LATHES

24"x12' Springfield Grd. Hd., late
Monarch, Hendey 12x30, 10x20 G.H. Late
26x12' Boye & Emmes 3 step cone D.B.G.
14"x6' Hendey Taper, Collets 16"x8'
9" LeBlond P&W 1"x18" Automatic
36x30' Putnam M.D., 36x22', 42x16
32"x35' Wickes, M.D.
20"x30' Boye & Emmes Grd. Hd., Late
South Bend, M.D., T.A., 16"x10', 9"x3'
Sundstrand Centering Machine #36, 6"x54"
Sebastian 12"x4' grd. hd. late
Wade, Hjorth, Hardinge, P & W Precision Bench

AUTOMATICS

Cone 8 spindle, 1⅞" Late
Cleveland Model A ⅞", 1¼", 2"; B 1", 2", ⅞"
Cone 4 spindle, Gridley
Brown & Sharpe #4, 6 Auto. #2 Hand

2000 TON BIRDSBORO PRESS

Self Contained

60" between rods left to right, 53" front to rear. Overall length of platen left to right 144". Stroke 30". Opening 36". 60 H.P., 3 phase 60 cycle, 220-440 V motor.

All Hydraulic equipment is completely engineered and checked by a competent staff, thus assuring reliability. Send us your hydraulic problems.

MISCELLANEOUS

Mitts & Merrill, Keysenters
Wiedman Turret Punch—Type R4P
Buffalo #0 Angle Roll M.D.
Bliss #58-OB Gap Presses, 62, 62A, 162
6" Vertical Shaper, P & W
10x10 Peerless Universal Shaping Saw
#7, 72 Fellows Gear Shapers
Pexto 6' Power Shears
Burke & Nichols Millers, Pl. & Univ.
Delta Single & Multiple Drills
Deckel G1, G2, GIF Engraving machines
Hanson-Whitney Thread Miller
Oliver Heavy Duty die making machine
J & L bench comparator; Zeiss Shadowgraph
Taylor-Winfield 50 KVA Spot Welder
Leland-Gifford 1, 2 & 4 spindles, Model MS

MILLING MACHINES

Cinn. #3 Pl., #4 Vert. Dial Type, Rect.
3B K. & T. Dbl. Overarm
Cleveland Vert. No. 1 M.D.; #1 Univ.
#2B K & T Univ.; No. 2A B & S Univ.
No. 3S Cincinnati, S.P.D. rapid trav.
Nos. 0Y, 2, 3, 4, 5 B & S Plain & Univ.
Hall Planetary Model D Thread Miller
Becker Nos. 3, AB, 5, 6 Vert.
No. 2, 3, 4 Cincinnati Vert.
P. & W. No. 12, 30" Profiler, M.D.
B. & S. No. 1, 3 Vert.
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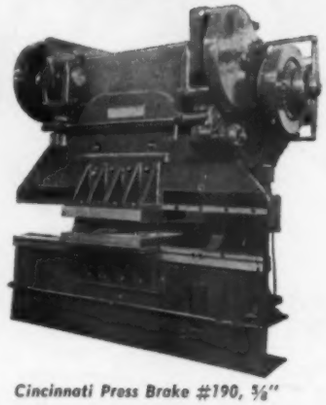
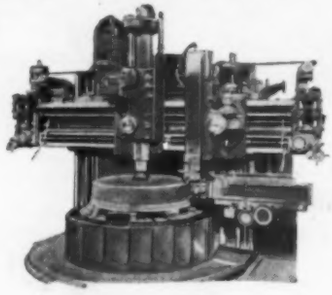
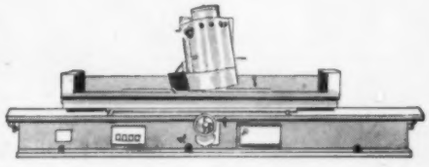


Cincinnati Press Brake #190, ⅜"





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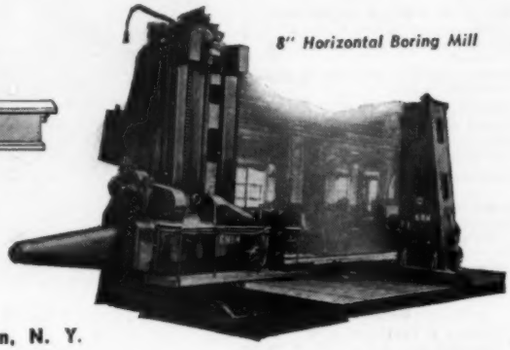
120" Niles Vertical Boring & Turning Mill



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GRINDER: #11 Blanchard Rotary Surface
GRINDER: Cinci. Cyl. Hyd. 6"x18" "Filmatic"
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GRINDER: #72A3 Heald Plain Internal
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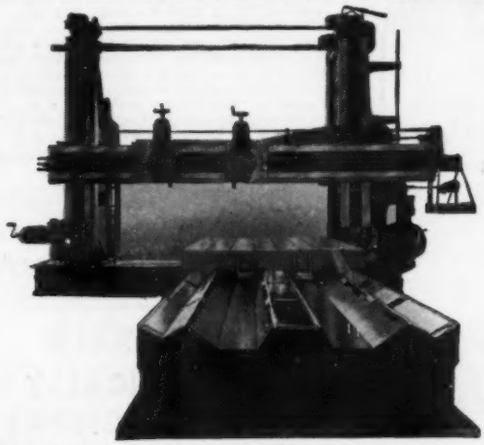

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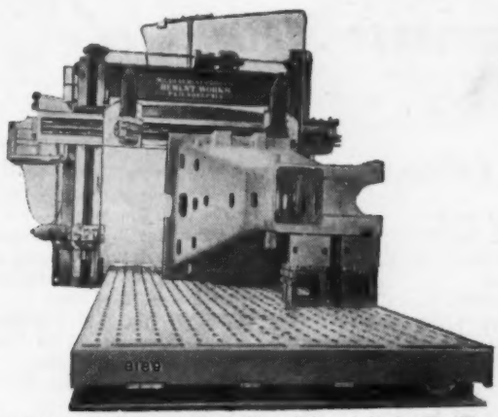

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New—1941-1945

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#25A Defiance 3¾" Table Type
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Type G Hammond Radial

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No 13 Gleason Univ. Gear Tester
15" Gleason Quenching Press
15" Gleason Spiral Bevel Cutter Sharpener
No. 4 Fellows TG Thread Generator

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No. 72A5 Heald Plain Internal
16" x 16" x 48" Thompson Type C Hydraulic Surface
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6" x 15" J & L Model TG615 External Thread
14" x 48" Cincinnati, Plain

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No. 0 Waterbury Farrel Screw Slotter
No. 250C Manville SSSD Header
No. 33 Waterbury Farrel DSOD Header
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No. 2-18 Cincinnati Automatic
No. 2-24 Cincinnati Automatic
No. 1H-18" Kearney & Trecker Mfg.
No. 4-36 Cincinnati Plain Hydromatic
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No. 26 Van Norman, Ram Type
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No. 2K Kearney & Trecker
No. 4K Kearney & Trecker
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No. 2 Standard Brown & Sharpe

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No. 4 Warner & Swasey, Geared Head
No. 3 & No. 4 Gisholt Geared Head
No. 5U Foster, Geared Head
No. 7A Jones & Lamson, Geared Head

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J. L. LUCAS & SON, INC.

BRIDGEPORT 5, CONN. **PHONE 9-3393**

This Beauty was once a rough, burr-ridden sheet of steel

This is the Pittsburgh Brush that did the job

HERE'S WHAT HAPPENED:

Before this beauty rolled out of the factory, a large part of it had to be thoroughly brushed by one or more hardy Pittsburgh Power-Driven Brushes. Unbelievable that this gleaming body you see was once a burr-ridden, rough sheet of steel. Then Pittsburgh Brushes went to work to produce this smooth steel of beauty.

This is what the Pittsburgh Brush helped to build

This is how the Pittsburgh Brush does the job

There's a Brush by Pittsburgh for *Every* Industrial Use—

GLASS	AUTOMOBILE	TIRE & RETREADING
STEEL	RUBBER	SHOE MANUFACTURING
PLASTICS	PAPER	& REPAIRING

In the complete Pittsburgh line are brushes of all types, including "Perfect Balance" sections, wheels and assemblies. Uni-fill scratch brushes as well as paint and other maintenance brushes. Consult the Pittsburgh engineering representative. He will gladly work with you in developing any type of power-driven brushes to meet your particular finishing specifications.

Use only Power-Driven Brushes By Pittsburgh—it pays

Specifically engineered to do your particular finishing requirements—the perfect balance of Pittsburgh's Brushes carefully controls distribution of the brushing stock. Perfect balance—maximum efficiency. You can depend on Brushes by Pittsburgh for top performance, enduring economy—and a minimum loss of time in change-overs.

Power Driven **BRUSHES**

PPG BRUSHES · PAINT · GLASS · CHEMICALS · PLASTICS

PITTSBURGH PLATE GLASS COMPANY

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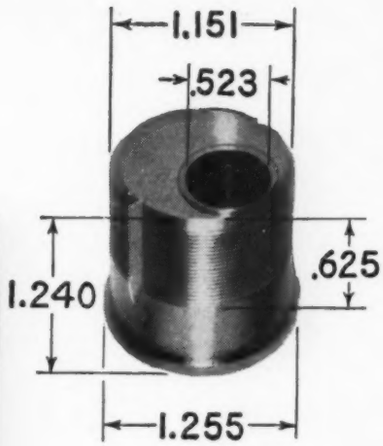
NEW BRITAIN AUTOMATICS LOWER BREAK-EVEN POINT ON THIS PIECE . . .

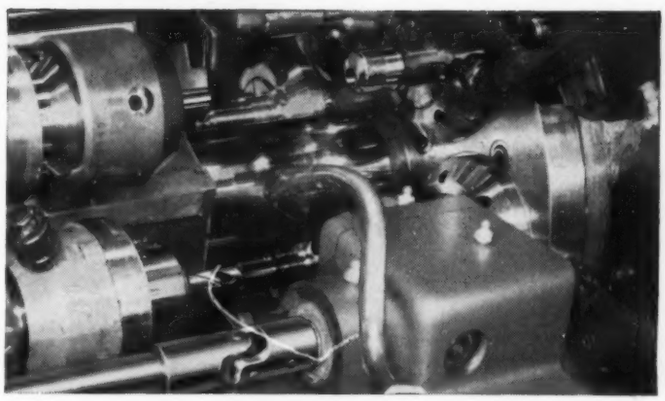
By

Eliminating 2nd operations
Reducing time and labor costs
Increasing production rate over 100%
Improving quality of product
Reducing material cost



A leading manufacturer formerly turned out the lock cylinder case illustrated from castings on five separate machines, each of which required a full time operator. Searching for more profitable production, he decided to investigate the possibility of automatic machinery.

By stopping the spindles and using eccentric drilling, plus milling attachments, New Britain engineers were able to put the entire job on one of our new model 601 Automatics using bar stock instead of costly castings. Production is maintained at 613 pieces per hour (5.8 secs. per piece), and the operator can easily take care of two other machines.



Eight operations plus cut-off are necessary to complete the piece. The spindle is stopped in the 4th position where the V slots are milled while the eccentric drilling attachment drills the main cylinder hole. Because specifications require the closest alignment between the two slots and the eccentric hole, the spindle is indexed to the 5th position without changing the alignment. In the 5th position the main cylinder hole is reamed while a cutter faces the end of the piece leaving a shoulder around the hole.

For a practical solution to mounting manufacturing costs . . . let New Britain engineers point the way to lowering the break-even point in your plant. Write today for your copy of "Cost Histories" which describes many specific approaches to more economical manufacturing.

Productivity, not price, is the measure of a machine.

NEW BRITAIN AUTOMATICS COST LESS PER FINISHED PIECE

THE NEW BRITAIN MACHINE CO.

NB

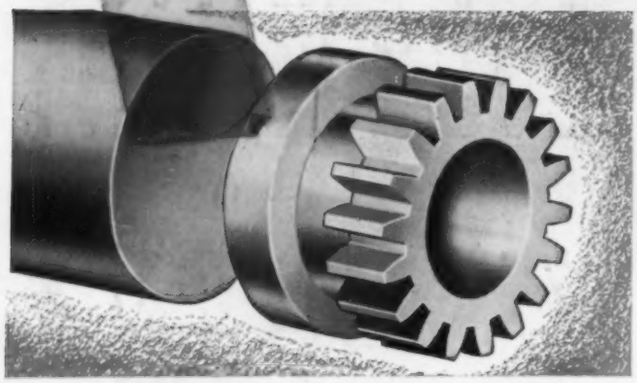
NEW BRITAIN

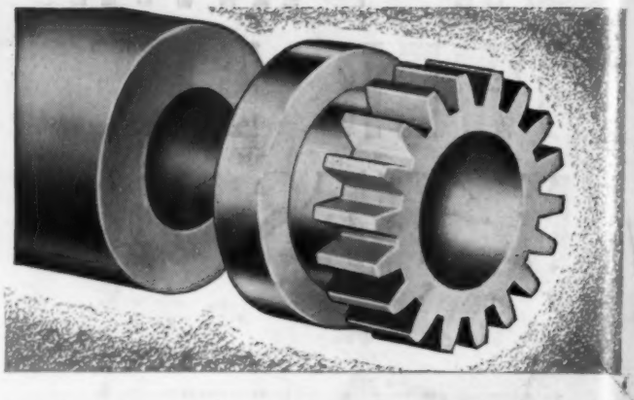
Automatics

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN-GRIDLEY MACHINE DIVISION
NEW BRITAIN, CONNECTICUT

348HC1

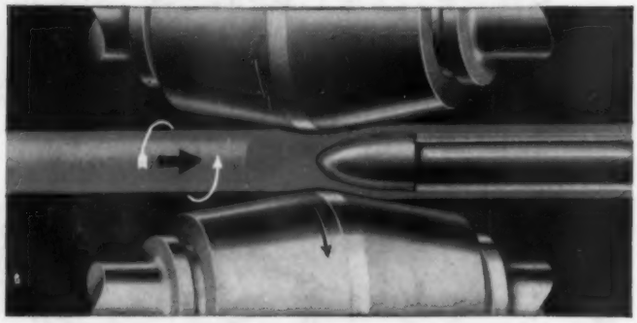
How to cut costs on cylindrical parts...

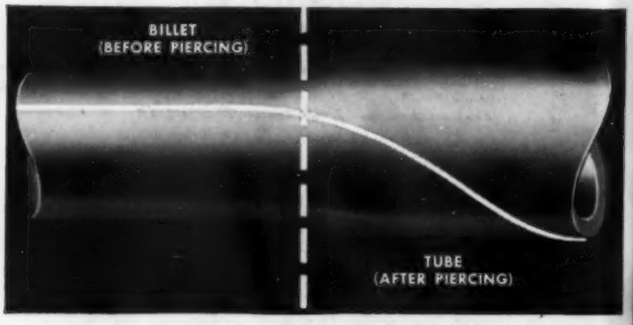




1 YOU'RE HALF THROUGH before you start when you make cylindrical parts from Timken seamless tubing instead of bar stock! There's no center hole to drill . . . less stock to machine. With Timken seamless mechanical tubing, boring can either be eliminated completely or is reduced to a rapid finishing operation. Since production is greatly increased you may show a worth while saving in costs . . .

and get better quality, too!





2 THE PIERCING OF TIMKEN TUBING is basically a forging operation. Red hot billets are worked between the rolls and forced over the piercing point with a spiral kneading action that thoroughly works the metal from the inside, from the outside, and throughout the entire cross section. Since the tubing is pierced at the rate of a foot a second, there's no time for heat loss—you get uniform fine forged quality from one end of the tube to the other.

This thorough hot working of the metal gives the tubing a uniform spiral grain flow and a refined grain structure for greater product strength and toughness. Close control of manufacturing—from melt shop through final tube inspection—assures uniform quality from tube to tube and heat to heat . . . uniform response to your machining and heat treating. Let our Technical Staff make an "on-the-job" analysis for you. No obligation. Write Steel and Tube Division, The Timken Roller Bearing Company, Canton 6, Ohio.

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

TIMKEN

TRADE-MARK REG U S PAT OFF.

Fine Alloy

STEEL

and Seamless Tubes

Specialists in alloy steel—including hot rolled and cold finished alloy steel bars—a complete range of stainless, graphitic and standard tool analyses—and alloy and stainless seamless steel tubing